WILD EDIBLE PLANTS: PROMOTING DIETARY DIVERSITY IN POOR COMMUNITIES OF LEBANON

LEBANON

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I. Synthesis

Problems of under- and over-nutrition are prevailing in developing countries including Lebanon, the Middle East and North Africa as a result of poor dietary intake, characterized by a heavy reliance on refined grains (white flour) as the primary source of energy. Moreover, an increase in the rates of chronic non communicable diseases (cardiovascular disease, diabetes) has been detected shedding a light on the emerging "nutrition transition" experienced by these countries, more specifically lack of food diversity. In November 2004, the Department of Nutrition and Food Science in partnership with the Initiative for Biodiversity in Arid Regions (IBSAR) and the Environment and Sustainable Development Unit (ESDU) at the American University of Beirut (AUB) started implementing the project "Wild Edible Plants: Promoting Dietary Diversity in Poor Communities of Lebanon" (WEP-DD) with the aim to promote diet diversification through supporting the consumption of traditional foods and wild edible plants. The research aimed at quantifying dietary diversity in the surveyed communities and investigating the associations between dietary diversity and food security and between dietary diversity and various risk factors for chronic disease. The hypothesis of the research work was that the consumption of wild edible plants would improve nutritional intake and sustain biodiversity in the ecosystem thus contributing to both human and ecosystem health.

This project has developed an in-depth understanding of the role of indigenous knowledge about wild plants identification, collection, and usage through several Masters' theses, reports, cookbooks and a comprehensive database of 46 plants. An assessment of the nutritional and health status in 3 rural poor communities was carried out by administering a questionnaire (total of 1000) including socio-demographic and dietary parameters. In addition, investigations of policy options to promote dietary diversification have evolved into a policy profile and brief. The setup of the Healthy Kitchen network in Aarsal, Kuakh and Batloun has played a vital role in the development and capacity building of these communities. The promotion of wild plants was launched through these kitchens primarily in catering events, cooking festivals and widespread media coverage of the project and its principles. On the academic level, the project has been a pool of resources for many. Over thirty research assistants and consultants worked on the project gaining knowledge, experience and financial return. Seven graduate students were attracted to this research that embedded theirs within that of the WEP-DD. Academic exchange with Canada, Sub-Saharan Africa, Yemen, Jordan, and Syria took place, as well as globally through international meetings and conferences.

The impact of the project was felt in the country and the region. The communities gained a sense of worth concerning their heritage along with the financial profit from the Healthy Kitchen projects as well as direct employment of several locals by WEP-DD. The research team conducting this multidisciplinary topic has been exposed to various learning opportunities particularly allowing growth in other disciplines (nutrition/agriculture/resource management/small business development/marketing…).

II. Executive Summary

During two very difficult years of Lebanon's recent history, the project Wild edible plants: promoting dietary diversity in poor communities of Lebanon (WEP-DD) succeeded in describing the health of the ecosystem as well as the health of an important section of the population in three poor rural communities of Lebanon. Also, WEP-DD identified the cultural, social, and nutritional importance of wild edible plants (WEP) and was successful in promoting traditional foods locally and nationally.

The objectives of the project were to:
Develop an in-depth understanding of the role of indigenous knowledge (IK) about wild plant identification, collection, and usage in improving health with attention to the recording and dissemination of traditional methods of identification, sustainable harvesting, and consumption.

Assess nutritional and health status in the surveyed communities and assess the intersectorial linkages including sociocultural, nutritional, health and current policies related to biodiversity and dietary diversification and investigate policy options to promote dietary diversification and rural development and capacity building through analysis of production, marketing and other factors that contribute to the availability of and access to a diverse diet.

Undertake a program of promotion of wild plants to improve dietary diversity at local and national levels and evaluate the impact of the program on the improvement of economic and health conditions of the rural poor, including the women and development of appropriate community based technology to improve micronutrient profile of staples.

Develop capacities at the academic and local levels in the region and at the global level with emphasis on improving communication skills and the setup of a scientific network dedicated to the study of wild plants as food with potential medicinal value.

Phase I of the project achieved, despite the short duration and troubled political and security situation, its objectives. With the help of the local community, and through extensive ethnobotanical work, we were able to produce a database of 46 most important WEP. The database stands as a distillate of various interdisciplinary endeavors. A geographic mapping of the plants was performed in the three communities. A thorough literature review on the therapeutic uses was also performed. An investigation of the indigenous knowledge related to the medicinal and health properties of the plant was also undertaken as well as recipes based on these WEP. Through workshops and cooking festivals, the community members shared their ancestral knowledge about WEP and the traditional food system. This helped reignite interest in the traditional food system.

Core to this project was the assessment of the nutritional and health status of the target communities. The findings are both important and disturbing. Our findings paint a bleak picture of the health of the communities in terms of chronic disease. Our sample of people between the ages of 40 and 60 suffer from high rates of high blood cholesterol (23

and 28% for men and women respectively), extremely high rates of high blood triglycerides (60 and 64% of men and women respectively), high rates of high blood glucose (22% of both men and women, half of whom can be classified as diabetic), and high rates of overweight (44 and 36% of men and women respectively) and obesity (17 and 34% of men and women respectively). We also found that food insecurity in terms of availability of food calories was rare in these communities. However, qualitative food insecurity was common with more than 50% of respondents reporting substituting less quality food for their usual diet some of the time. The relationship between dietary diversity and food security was investigated. People who resorted to WEP collection and relied some of the time on their gardens were less likely to be food insecure. It was also found that providing a healthy weekly family food basket would only marginally increase the cost for the consumers (5.6%). Unbridled promotion of wild edible plant consumption as a way to improve the diet is not advised. Our assessment of the ecosystem indicated that many of the popular WEP were being depleted and that diversity and density of WEP was low, except for aquatic species. The investigation of the policy environment for biodiversity and diet uncovered a glaring dearth of policy options beyond a few, usually unheeded, laws for the sake of conservation, often in response to Lebanon's signing of international treaty, such as the Convention on Biodiversity.

This project stirred a great deal of interest in Lebanon, as if the topic struck a cord in the popular imagination. It appeared as if interest in traditional food needed an outlet. So much that, in the community of Aarsal, community members thanked the research team for working on this topic and indicated that scientific interest in their traditional plants helped them overcome the stigma associated with consuming them. The plants, and the traditional food system by the same token, were promoted in the communities themselves through cooking festivals and at the national level through television programs and the written media as well as through the publication of cookbooks. The Healthy Kitchen initiative also helped spread the word about traditional food while contributing to improved income. In fact, more than 20 women and young people were directly concerned by this program, benefiting from training and using the traditional food as a way to generate income through catering events. The work of these few people in each community was also pivotal in making the rest of the community aware of the health and nutrition potential of the traditional food system. This is of value in a context of rapid westernization and nutrition transition where consuming one's traditional food can become an indication of one's inability to embrace modernity. The results of the nutritional and health status assessment make this promotion all the more acutely necessary.

The project established a high level of trust in the communities and was able, in terms of capacity development, to train and employ a large number of community members in data collection. It provided training in wild plant harvesting and processing and in good manufacturing practices to the people involved in the healthy kitchen program who also benefited from training on marketing and the setting up of cooperatives. Various nutrition education activities took place in the communities and provided highly needed nutrition and health information. It was noted that individuals involved with the healthy kitchens

were often perceived as ambassadors of nutrition knowledge to the rest of the community.

The interdisciplinary nature of the project provided the researchers with an opportunity for constant exchange across disciplines. This is the first project of its kind to link between biodiversity, nutrition, environmental preservation, sustainable development, economics, policy and human health at the American University of Beirut. A great deal of regional and international collaboration also took place and helped cross-pollination between Lebanon, Syria, Jordan, as well as East Africa. The Lebanese experience with biodiversity, nutrition, and health was also shared in international forums, be they international scientific conferences in Barcelona, Montreal, Cairo, and Galway or small meetings in Rome, Ottawa, and Aleppo.

In summary, the WEP-DD allowed a thorough investigation of the linkages between the ecosystem, the diet, and health and pointed to a number of problematic areas in the health of the environment as well as that of the community and the individuals

III. The research problem

Lebanon has witnessed changes in the dietary habits over the years. Lebanon's traditional diet is fading in favor of a westernized diet. In parallel, the prevalence of non-communicable diseases is on the rise when, in the 20th century, nutrition problems were linked to deficiencies (Baba, 1998). On one side of the scope, 53 % and 17 % of the Lebanese adults, 19.3% and 5.3% of the children ,are identified as overweight and obese respectively (Sibai et al., 2003). On the other hand, data illustrate that lower socioeconomic status children exhibit both mild and moderate stunting, an indicator of under nutrition (Melzer, 2002). Micronutrient deficiencies prevail in current times. Research confirms the occurrence of iron deficiency in 33% of women and 25.2 % of children (Hwalla et al., 2004; Hwalla and Adra, unpublished)

The main cause of this malnutrition can be linked to the lack of dietary diversity. Dietary diversity is a trait of traditional food systems. However, the current trend in the urbanization of diets has led to its simplification with a focus on high fat, high sugar, low fiber foods. The diet in the world and particularly in Lebanon is focusing on a few staple foods. According to the World Health Organization (WHO), the average daily consumption of bread in Lebanon per capita per day is 350 g (WHO, 1998). Wild edible plants used to be part of the regional diet, thus contributing to its diversity. The recording and dissemination of IK has invaluable cultural significance. The traditional Indigenous Knowledge (IK) related to these plants, their harvesting and consumption is on the verge of extinction. The holders of IK are old in age and IK has not been valorized in the communities. According to Jeambey (2005), the scarcity of WEPs' IK is due to the fact that it is not being transferred between generations. Focus group meetings carried out in the targeted communities gathered IK regarding collection, consumption and health benefits of wild edible plants (WEP). Key informants were above the age of 58. Promoting consumption and re-introduction of wild edible plants would greatly contribute to diversify the diet thus improving nutrition, food security, and health of communities especially those economically disadvantaged. Moreover, promoting the consumption and use of wild edible plants would benefit communities economically

through the increased production and marketing of local traditional recipes. The bigger portion of this benefit goes to the women in these areas by providing extra income, fostering independence and promoting gender equity. In parallel, encouraging production and consumption of various plant products would also contribute to increased diversity in agriculture production thus contributing to an improved ecosystem. After raising awareness about micronutrient deficiencies and overnutrition and ways of combating them through dietary diversity, specifically using WEP, policy change can be achieved at the government and organization level.

Our target population and topic interested many new students who have grafted their thesis topics to our project. This adds three new research problems to those previously proposed. First, an assessment of the relationship between lutein and zeaxanthin intake and age-related cataracts relative to WEP has been studied in Hermel. Second, a PHD thesis aimed at characterizing urban vs. rural dietary patterns in Lebanon and their relationship with cardiovascular risk factors and analyzing the relationship between diet cost and dietary quality. The third thesis assessed the determinants of chronic diseases in the community of Batloun through testing nutritional knowledge and developing a nutritional educational tool.

IV. Research findings

The communities where WEP-DD was carried out are poor rural communities where knowledge about wild edible plants and the traditional food system is still present. The selected communities have received relatively low attention from the government or international agencies.

Community Descriptions

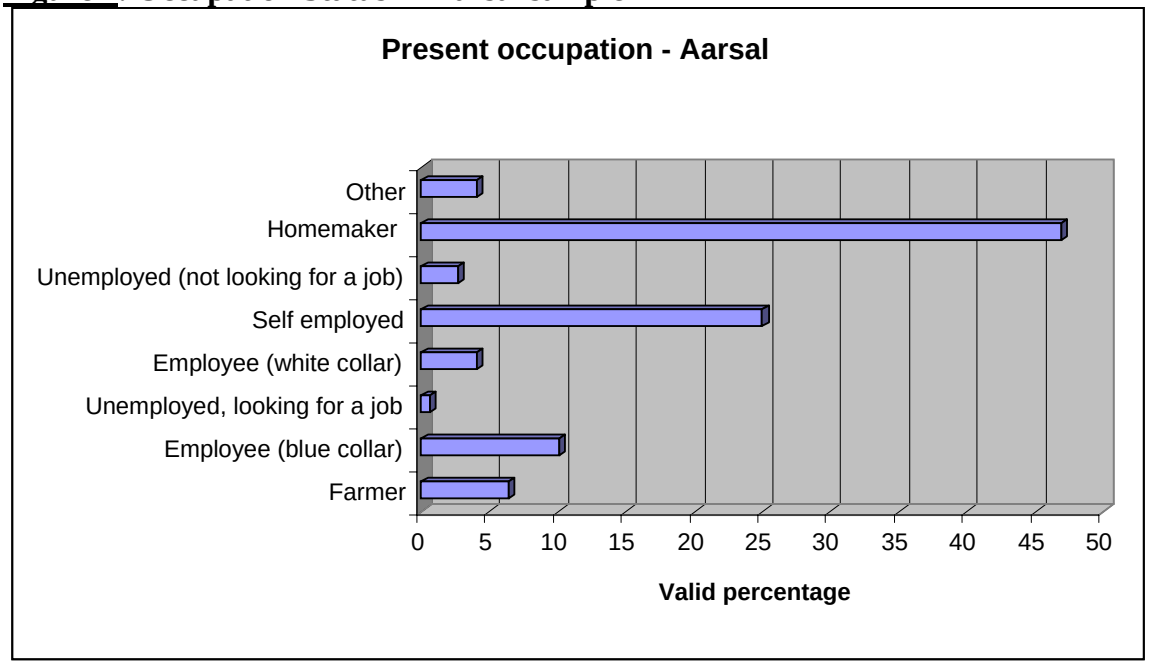
The following community descriptions are based on interviews with key informants and mayors of the villages as well as results from our survey.

Map of Lebanon:

Community 1: Aarsal (Appendix 1)

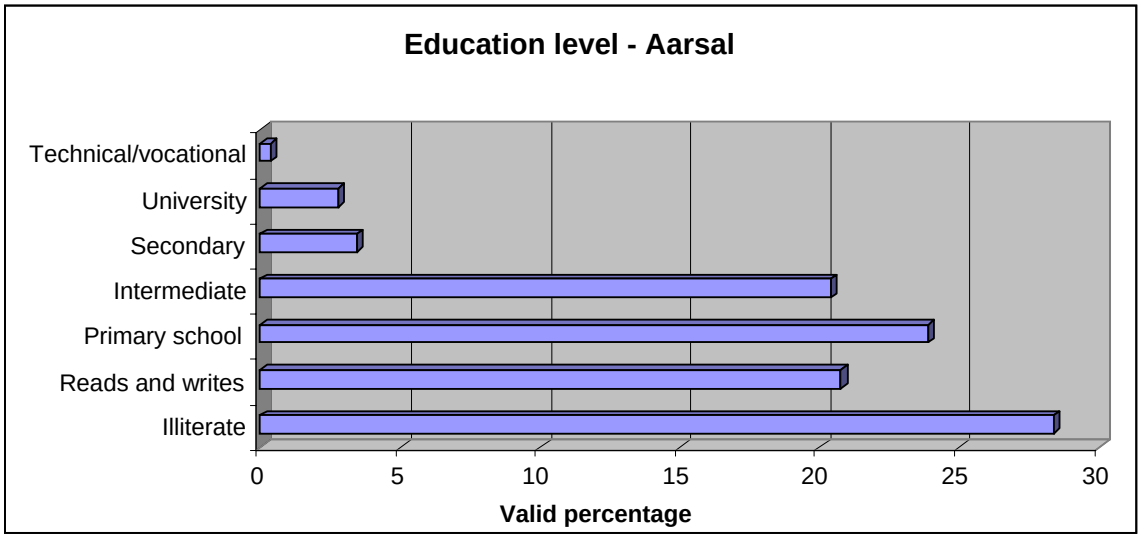
Aarsal is located in the Bekaa, 35 kilometers away from Baalbeck. It is 14 km away from the Syrian border and 122 km away from the Lebanese capital Beirut. Its altitude is 1400-2000 m above sea level. The land, 36000 hectares (360 km²), is divided into a vast eastern region (an arid area), the valleys which surround the town, and the mountainous region (Al Jurd). Groundwater is present as well as a river which flows seasonally. The climate is humid in the north and dry desert in the south.
Aarsal has a population of roughly 35,000 of which 24,500 are permanent residents. Their major source of income is from stone quarrying, agriculture, and rearing goats and sheep. Wheat, chickpeas, and barley are cultivated for local consumption. Another common agricultural product in Aarsal is fruits trees especially cherries, apricots, hawthorn, sumac and grapes. Wild pear trees and wild almond trees are also present. Cultivated vegetables include eggplants, tomatoes, and cucumbers. Most production is used locally with some vegetables marketed in Zahleh. The dairy and meat produced are used for consumption in the local area, the Bekaa, and by industries in Chtaura. Data from the questionnaires show occupation status in the Aarsal sample of 40-60 years old as indicated in Figure 1.

Figure 1: Occupation Status in Aarsal sample



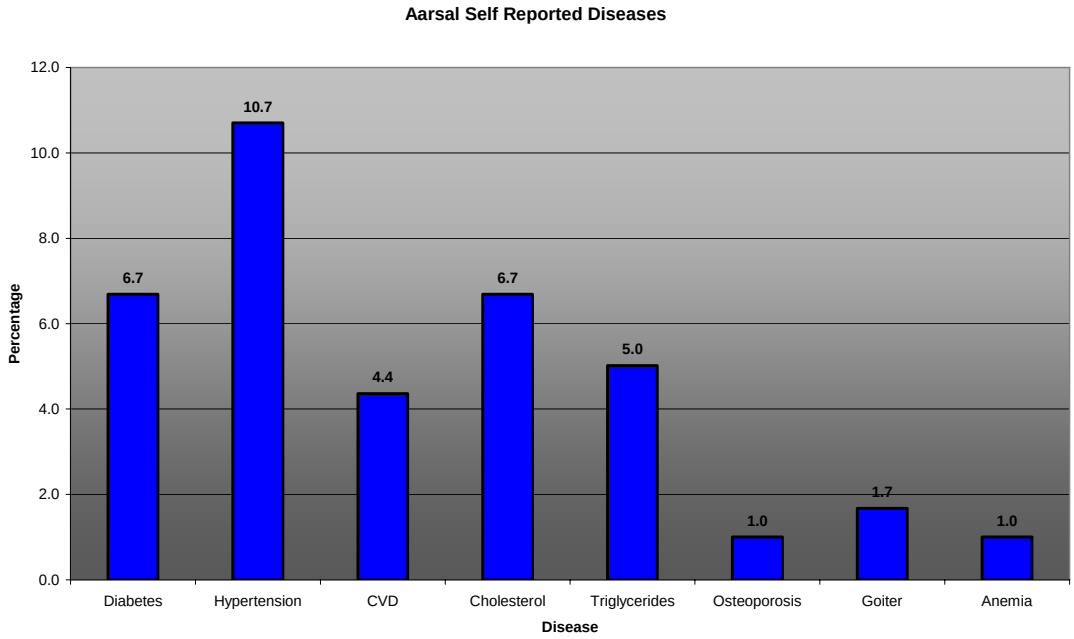
Electricity and telephone services are provided though there are no sewage disposal networks. Water for household consumption is from artesian wells and is stored in water tanks. There are 5 public schools and 7 private schools, and 1 vocational institute. The educational level of the community is shown in Figure 2. There is a health and social center run by the Ministry of Social Affairs. Local health care is provided by 5 dispensaries and doctors of various specialties.

<u>Figure 2</u>: Educational level in Aarsal sample



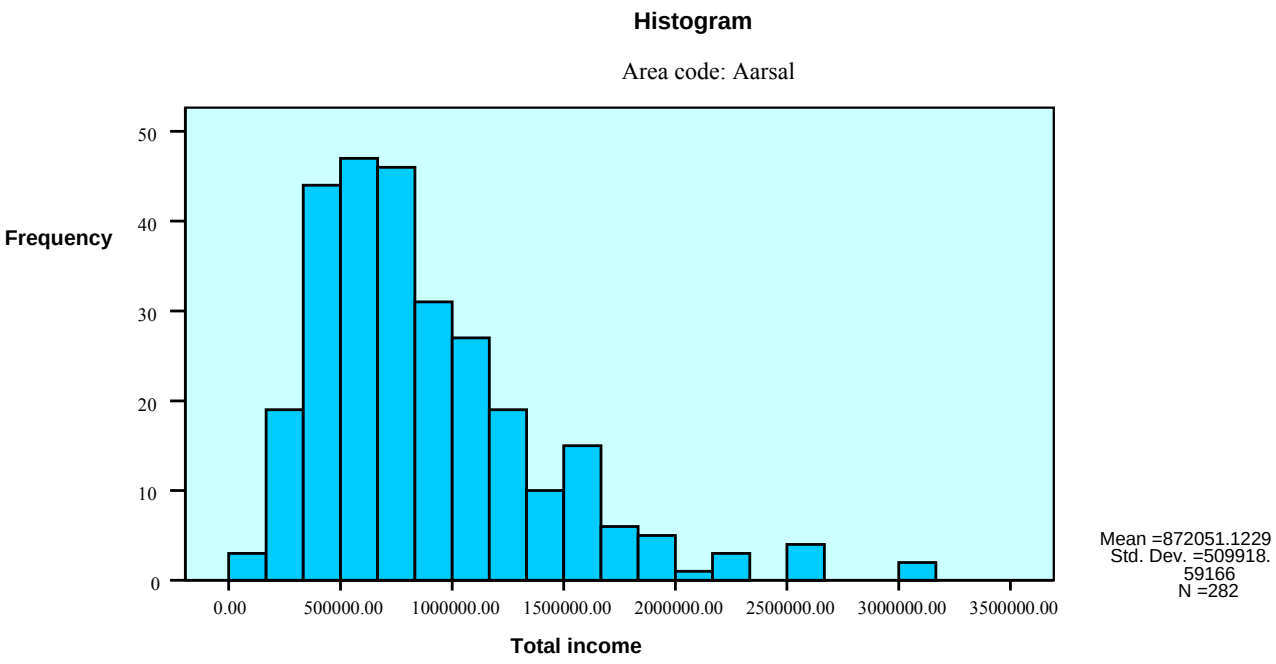
According to the results of our survey (refer to Figure 3), the most self reported diseases in Aarsal are hypertension (10.7%), Diabetes (6.7%), high cholesterol (6.7%), and high triglycerides (5%).

<u>Figure 3</u>: Percent of self reported diseases in Aarsal sample



Data results show that in Aarsal, (n= 282), the mean household income was 872,051 LL per month (roughly 872 Canadian $) (Figure 4).The mean number of people living in the household was 6.4 and while respondents had an average of 5.72 children, the mean number of children under 15 living in the household was only 2.1 reflecting the age of respondents (40-60).

<u>Figure 4</u>: Frequency of Distribution of Total Income in Aarsal sample

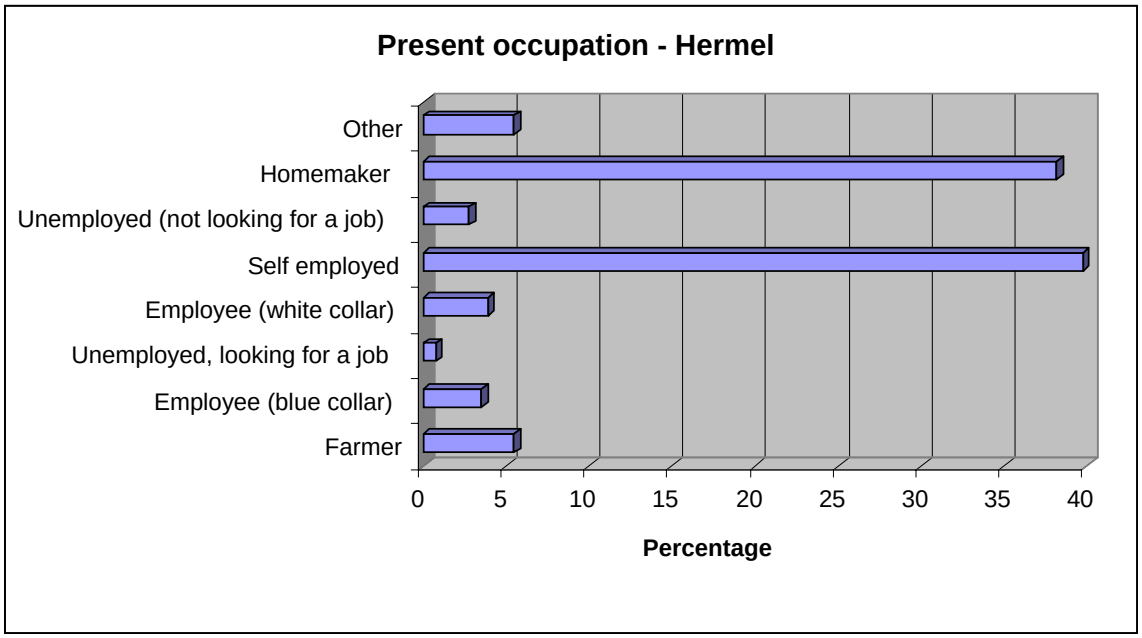


<u>Community 2: Hermel</u> (Appendix 2)

Hermel is located in the Bekaa, 16 km away from the Syrian border. Its altitude is 750m above sea level. The town has 300 hectares (3 km²) of land and has an official population of 100,000 of which only 50% reside in the town.
The climate is moderate to semiarid. The most widespread agricultural production is watermelon, green peas, beans, potato, and eggplant which are distributed in Lebanon for consumption. The fruit trees cultivated in this village are olive, apricot, green plum, pomegranate, figs, loquat, and grapes vines. A major portion of the land is used as forage pastures. Sheep, cows, and goats are herded to graze from the land. The goods produced are used within the local community and a few are marketed in the capital Beirut.

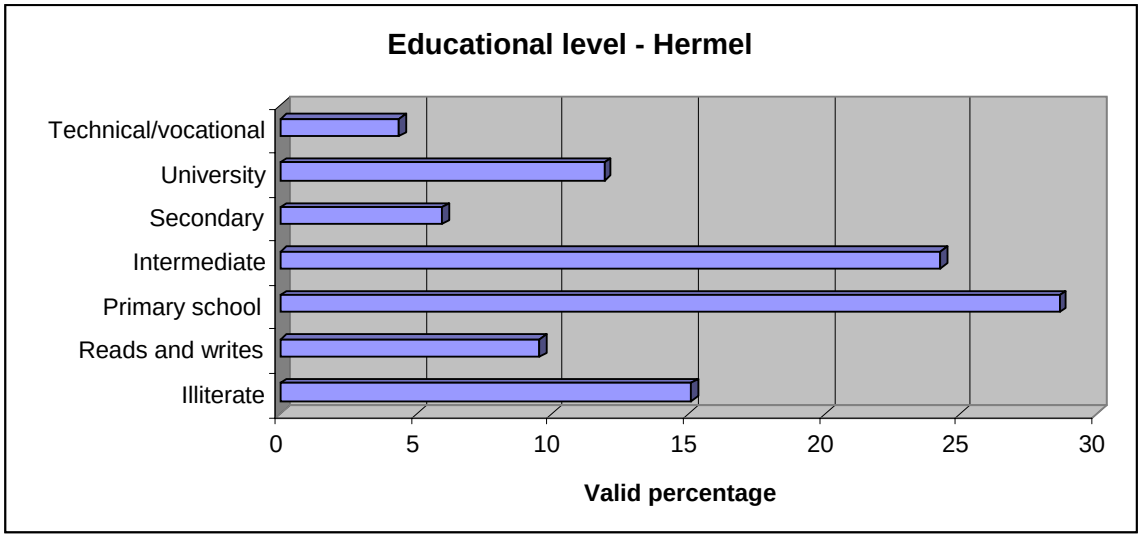
There are some 15 touristic and historical locations that provide a source of income to the families. Also, there are several trout farms on the Assi river banks whose production is chiefly marketed through local restaurants. The industrial sector in the village is almost inexistent with only a small milk factory that supplies the town. Figure 5 shows the occupation distribution in Hermel sample.

Figure 5: **Occupation Status in Hermel sample**



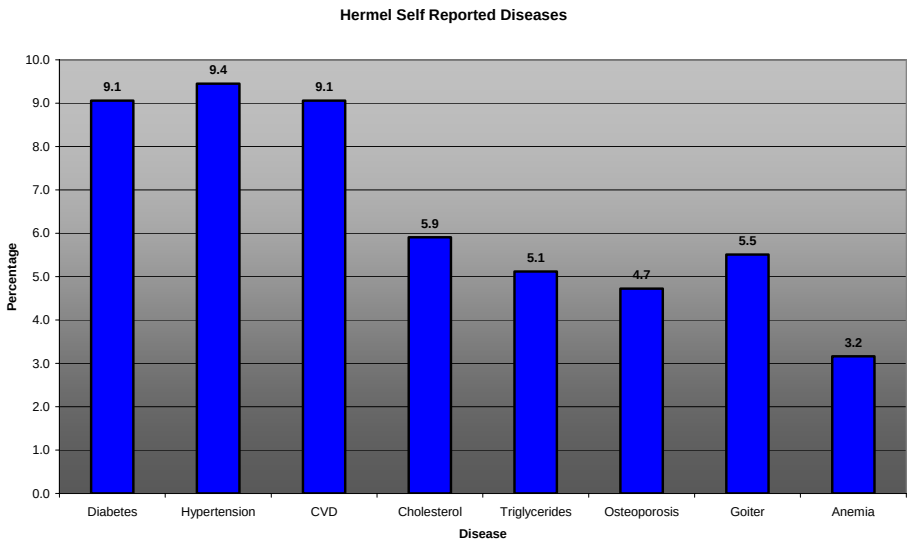
Infrastructure is of poor quality. Electricity is provided but use is very restricted in some neighborhoods. However, the telephone system is good and is provided to the whole town. There is no sewage disposal system. Drinking water is supplied from a spring and distributed to the whole village. Water for household consumption is provided from artesian wells. The Assi River, one of two major rivers in Lebanon, passes through Hermel. Water consumption from this river is however limited due to trans-boundary issues with Syria. There are 8 elementary schools (3 public and 5 private), one intermediate school and 2 secondary schools, in addition to 2 vocational institutes. The educational level of 40-60 year old Hermelites is displayed in Figure 6.

Figure 6: **Educational level in Hermel sample**



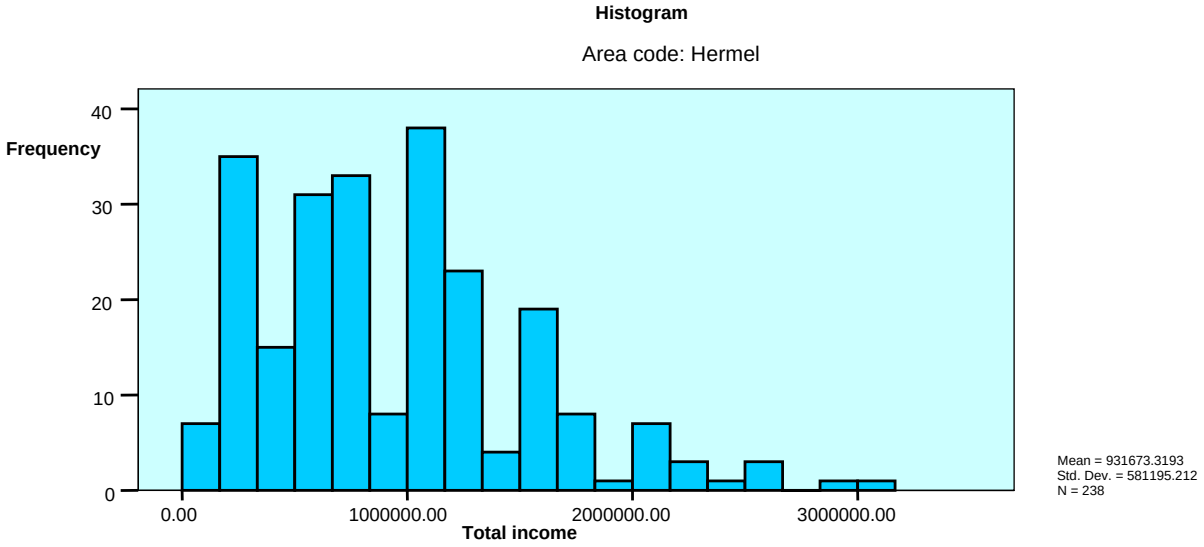
Survey results (refer to Figure 7) show that the most reported health problems in Hermel are: hypertension (9.4%), cardiovascular diseases (9.1%), diabetes (9.1%) and high cholesterol (5.9%). There are numerous doctors' clinics, 5 dispensaries and two hospitals (1 private, 1 public).

<u>Figure 7</u>: Percent of self reported diseases in Hermel sample



According to our surveys (n=255), the mean household income in Hermel was 931,673 LL per month (roughly 931 Canadian $). The mean number of people living in the household was 5.8 and while respondents had an average of 5.1 children, the mean number of children under 15 living in the household was only 1.4.

<u>Figure 8</u>: Frequency of Distribution of Total Income in Hermel sample

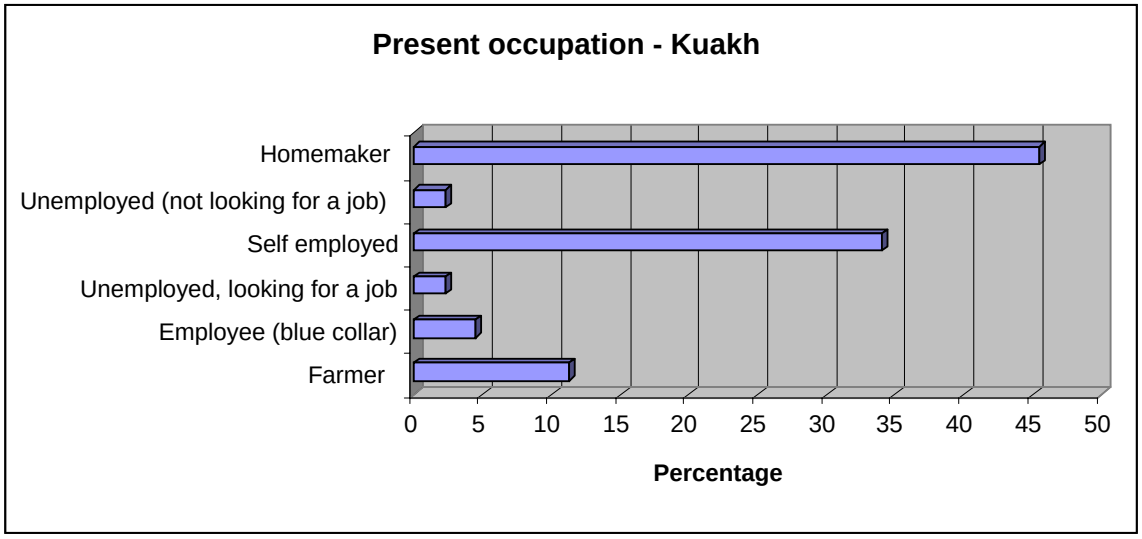


<u>Community 3: Kuakh</u> (<u>Appendix 3</u>)

Kuakh is located in the Bekaa, 8 kilometers away from Hermel, 12 km away from the Syrian border and 151 km away from the capital Beirut. Its altitude is 650 m above sea level. With a land area of 10 hectares (0.1 km²), the population is 3000 but just 20% remain as residents in this remote village.

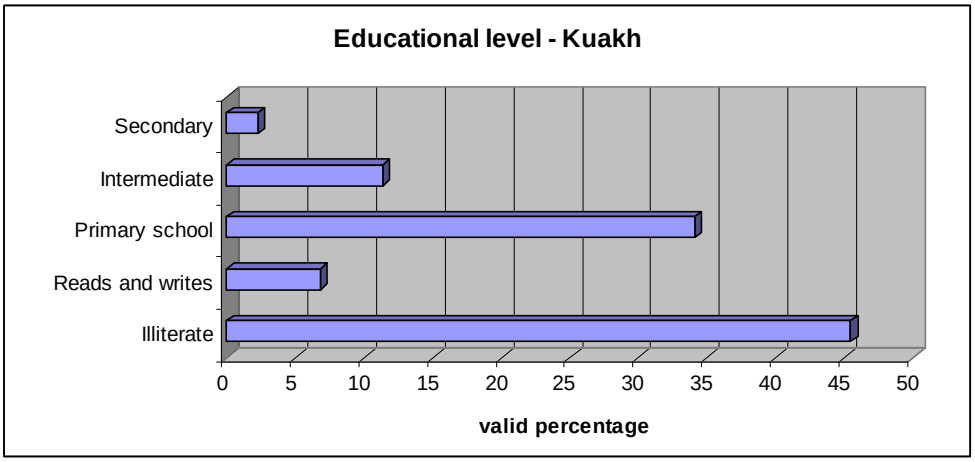
The climate in Kuakh is moderate to semiarid. The most widespread agricultural production is wheat which is used for local consumption and cattle feeding. The fruit trees cultivated in this village are olive trees and almond trees. A major portion of the land is used as forage pastures. Most of the families depend on raising animals for a living. Sheep, cows, and goats are herded to graze from the land. As for the occupation, the percentages of different occupations in Kuakh sample are shown in Figure 9.

<u>Figure 9</u>: Occupation Status in Kuakh sample



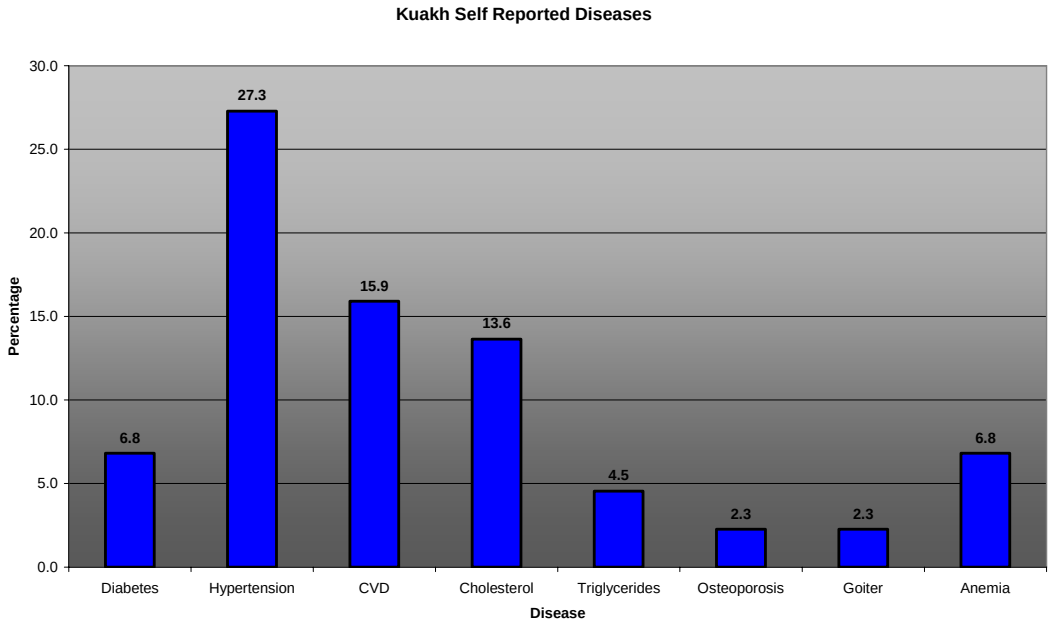
Infrastructure is poor. Electricity is provided but use is very restricted and there is no landline telephone system although the cell phone network reaches most areas of the village. There is no sewage disposal system; only septic tanks are used. Drinking and consumption waters is provided from artesian wells and distributed to the houses (has been distributed for the last two years only, the distribution system had been un-operational since the beginning of the civil war). There is one primary school in the village. Figure 10 illustrates the distribution of educational level in Kuakh in our sample of 40-60 year old adults which shows the relatively high proportion of illiterate individuals relatively to the other communities in the Bekaa..

<u>Figure 10</u>: Educational level in Kuakh sample



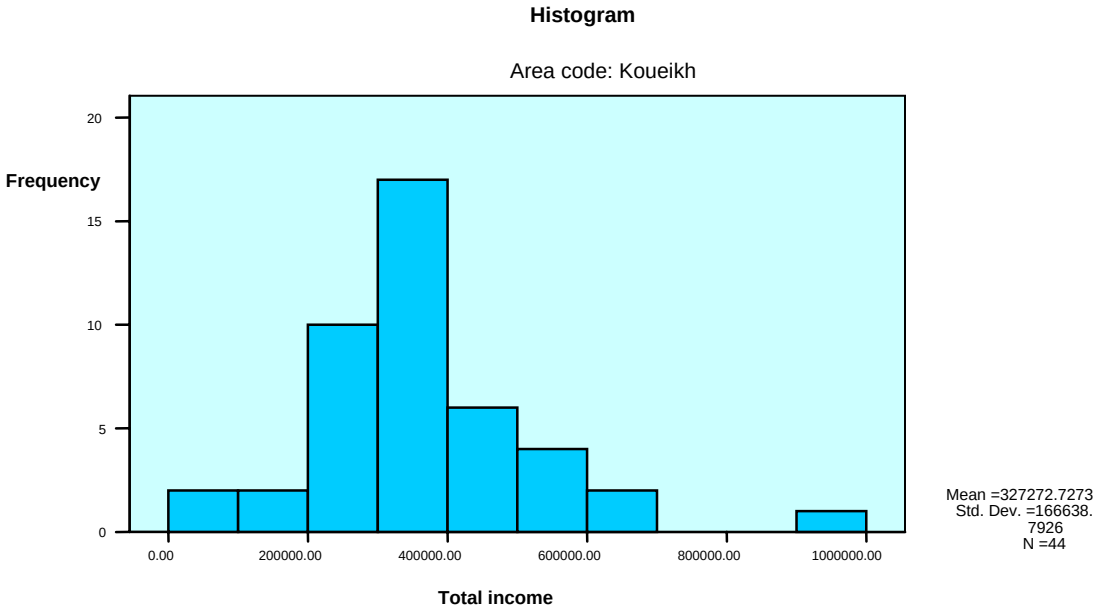
According to the survey (refer to Figure 11), the most frequent stated health problems in Kuakh are hypertension (27.3%), cardiovascular diseases (15.9%), high cholesterol (13.6%), and diabetes (6.8%). There is one dispensary which opens one day a week.

<u>Figure 11</u>: Percent of self reported diseases in Kuakh sample



Survey results in Kuakh (n=44) show the mean household income to be by far the lowest among the communities surveyed, at 327,273 LL per month (roughly 327 Canadian $). The mean number of people living in the household was 7.1 and while respondents had an average of 6.5 children, the mean number of children under 15 living in the household was 2.2.

<u>Figure 12</u>: Frequency of Distribution of Total Income in Kuakh sample



The Chouf cluster
In the Chouf Mountains of Mount Lebanon, three villages in close proximity were selected for surveying: Batloun, Kfar Nabrakh and Warhaniyeh. General descriptions of each community are based on interviews with mayors and are followed by survey results grouped for all three villages in the Chouf. These villages are around 60 km from Beirut.

Batloun (Appendix 4)
Batloun is located at an altitude of 1250 m above sea level and covers 5.5 km². It is located 8 kilometers away from the Caza (province) Center in Baakleen. Batloun is rich in groundwater and there is a river that flows in the village. Vegetables and fruits are grown for local consumption and distributed in the markets of Sidon. The most cultivated fruit trees are apple, peach, cherry, figs, almonds and grapes. Only small animals are raised for household consumption.

Batloun's official population is 4500, of which 80% are residents. The main sources of income are from agriculture, governmental jobs, local trade and industries. There is one public school with kindergarten, elementary, intermediate and secondary levels, and a vocational school. Cultural and social events take place in the Batloun Cultural Club. As for medical care, there are 4 clinics and 2 pharmacies in Batloun. The village is however in close proximity to the Ain Wa Zein hospital managed by a Druze charity organization and caters for the inhabitants of the surrounding villages, including the cluster of interest.

The infrastructure is relatively good with a functional telephone system. Electricity is provided but restricted to a certain number of hours. The sewage disposal system is of minimum quality. Water is provided from the Barouk springs by the city in limited quantities, augmented with water from artesian wells and delivered by private companies to holding tanks.

Kfar Nabrakh (Appendix 5)

Kfar Nabrakh is located at 1000 m above sea level. Covering a land area of 4 km², it has a population of 9000. It is 5 kilometers away from the Caza (province) Center in Baakleen

Being rich in ground water, the main source of income is agriculture, with some local industries including carpentry, stone quarrying, a printing press, and welding metal for cars. Vegetables and fruits are the most widespread agricultural products, but used for local consumption only. The most cultivated vegetables and fruit trees are tomato, cucumber, onions, apple, peach, olive, cherry, fig, and grapes. Raising livestock, such as cows, and goats is a common practice in Kfar Nabrakh. Dairy and meat are produced for local consumption.

There is one public and one private school, each offering kindergarten, elementary, and intermediate levels. This village has two medical clinics. Electricity is provided sporadically and maintenance is not always available. However, the telephone system is good in the village. The sewage disposal system is of minimum standard. Drinking water is provided from the Barouk springs and is distributed to approximately 50% of the

houses. Household consumption water is provided from artesian wells and distributed to the houses for a fee by private companies.

Warhaniyeh (Appendix 6)

Warhaniyeh is located 15 kilometers away from the Caza (province) Center in Baakleen. Its altitude is 1200 m above sea level.

The most widespread agriculture is that of fruit trees such as apple, peach, and pear. Animal rearing is no longer common in Warhaniyeh, although certain villagers raise chickens and goats for their families. There are two factories in the village, one manufacturing frozen meats and the other burghul. Both sell to a predominantly Lebanese market.

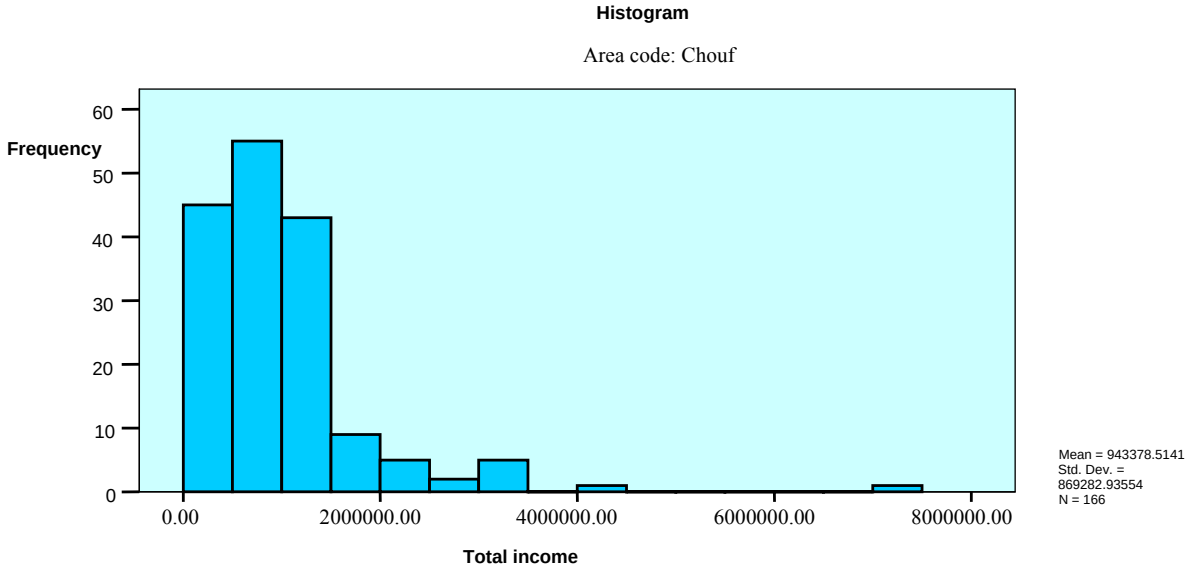
Electricity and telecommunication network systems are of good quality and a sewage disposal system is available, though aging and insufficient. Drinking water is provided from Barouk springs but is not distributed to the whole village. There are no artesian wells in the houses and groundwater is not available. There is one elementary school in the village. In Warhaniyeh there are no clinics or other health care facilities.

Chouf cluster

According to our surveys in the three villages of the Chouf cluster (n=200), the mean household income was 943,379 LL per month (943 Canadian $) (refer to Figure 13). The mean number of people living in the household was 4.4 and while respondents had an average of 2.9 children, the mean number of children under 15 living in the household was 0.9. As for the health problems reported in the survey (refer to Figure 14), the highest percentages were for high cholesterol (11.1%), goiter (9.5%), hypertension (7%), and diabetes (6%).

Unemployment is relatively low in Chouf sample as well as illiteracy (refer to Figure 15 and Figure 16 respectively)

<u>Figure 13</u>: Frequency of Distribution of Total Income in Chouf sample



<u>Figure 14</u>: Percent of self reported diseases in Chouf sample

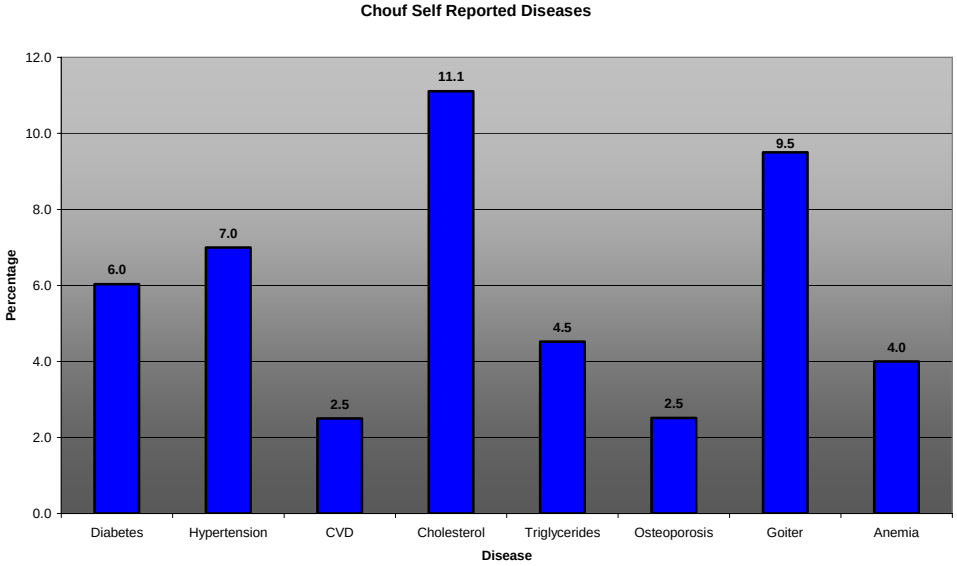


Figure 15: Occupation Status in Chouf sample

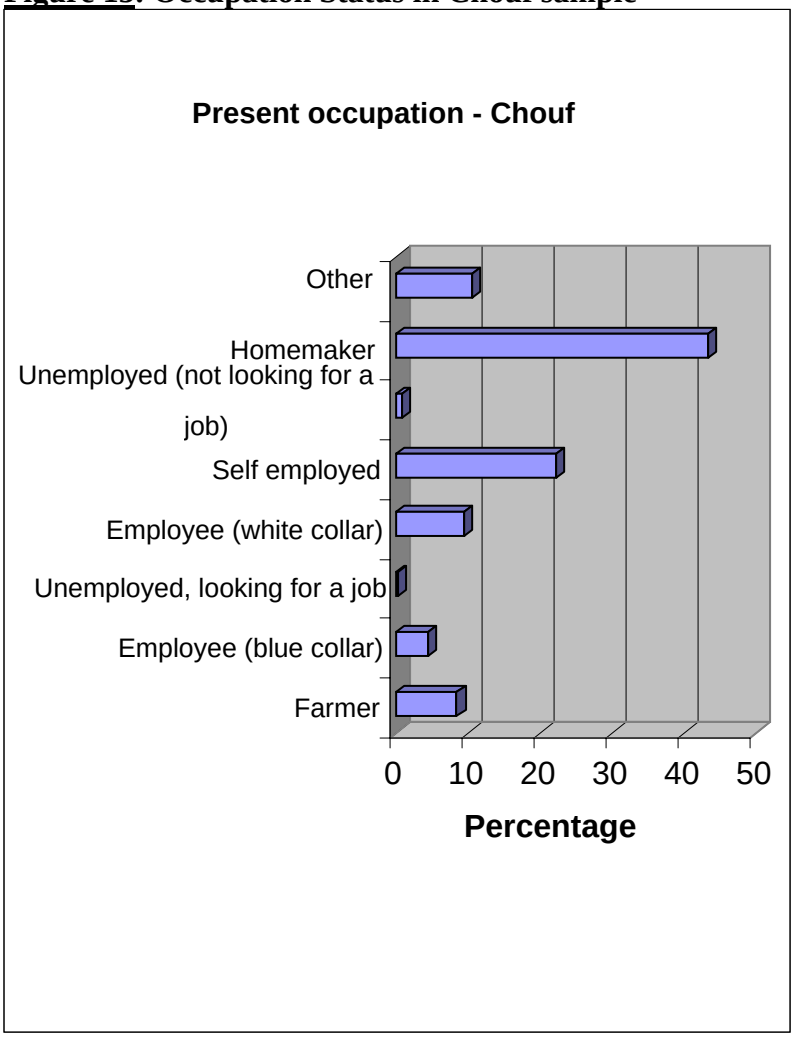
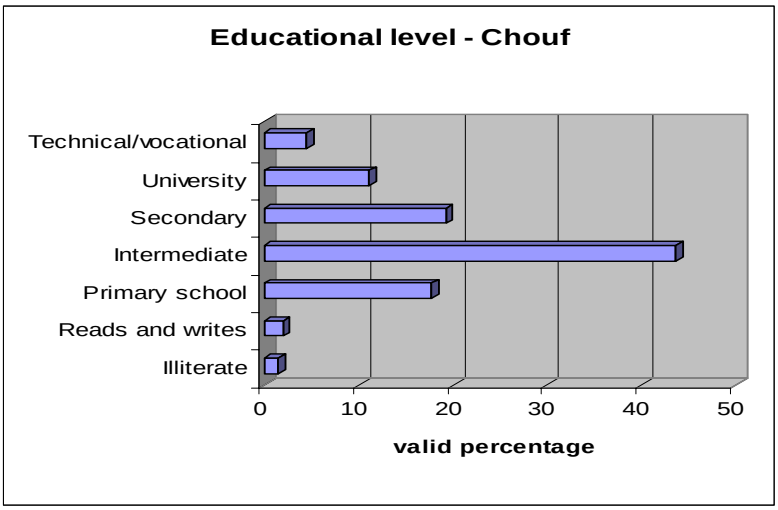


Figure 16: Educational level in Chouf sample



Survey data and results: (Appendix A)

Surveys of WEP-DD were conducted during the period from June to August 2005. A random list of households was drawn in each community from municipal tax files. One man and one woman between the ages of 40-60 were approached from each household for interviewing. However, in practice many individuals from one-person households were also interviewed. If more than one person met the age criterion, the person interviewed was the one considered to be the male or female head of the household. A total of 800 questionnaires were conducted in the rural regions, 799 of which were analyzed. There were 255 surveys collected in Hermel, 45 in Kuakh, 299 in Aarsal and 200 in 3 villages in Chouf. The age group chosen was 40 -60 years in order to reduce variations due to age and since the project was interested in traditional foods which are still consumed by older rural residents. The refusal rate in the rural survey was relatively low.

A draft questionnaire was written and piloted. Interviewers from the communities were recruited and trained in dietary assessment techniques, survey administration, and taking necessary anthropometric and biochemical measures (height, weight, blood pressure, blood cholesterol, blood glucose, etc). Ethical approval was obtained from the American University of Beirut Institutional Review Board.

A sub sample of 295 households was re-contacted during the following winter season, both to take a second 24-hour recall and for an additional questionnaire asking about agricultural production.

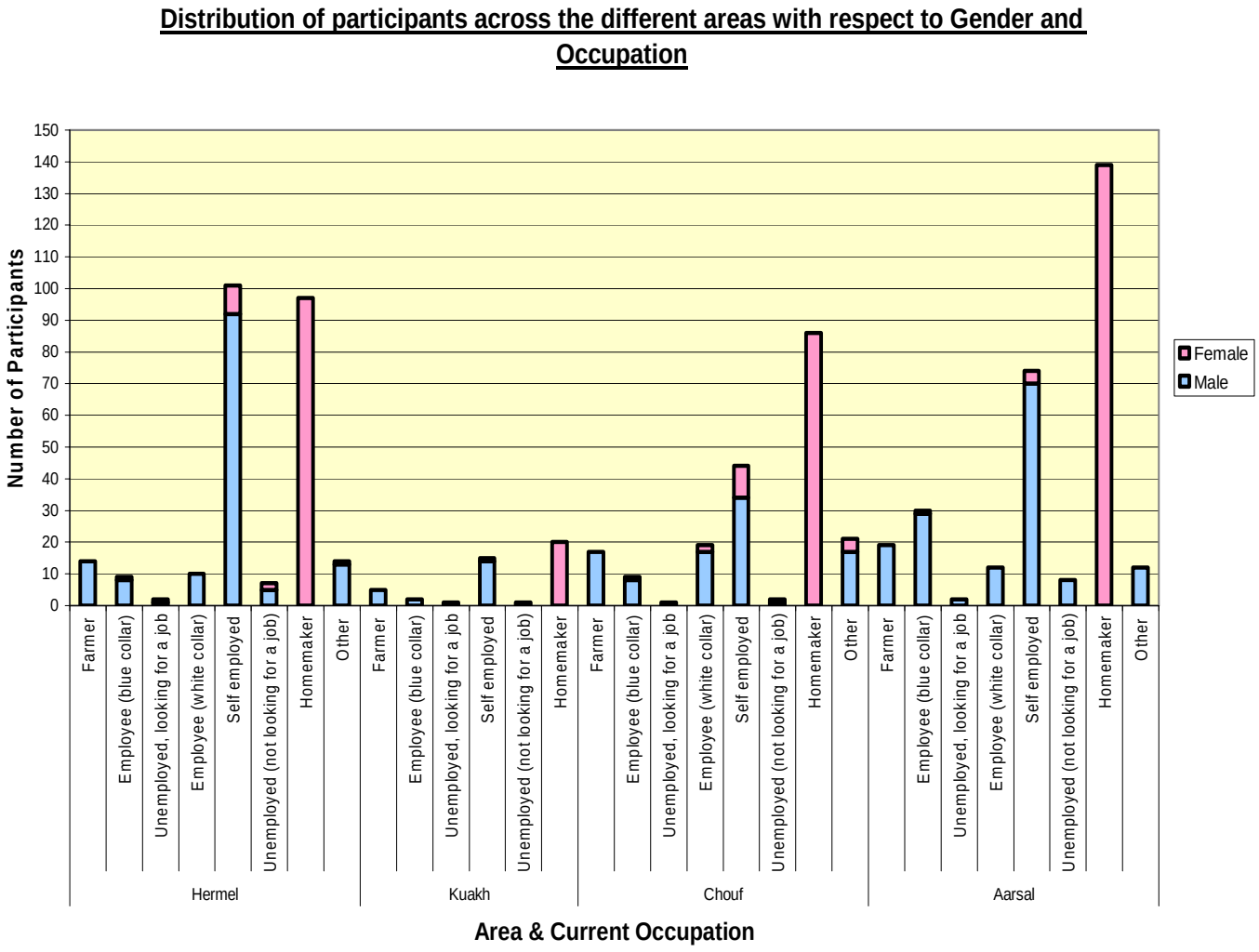
Completed questionnaires were entered in SPSS (version 14) and used for descriptive results, t-tests and regression analysis.

The sample under study consists of 48% females and 52% males. Distribution of respondents by region shows that 37% come from Aarsal, 32% of the respondents come from Hermel, and only 25% and 6% come from Chouf and Kuakh respectively. Because of the close proximity of Hermel and Kuakh, we refer to our target areas as 3 instead of 4 in some instances.

As for the educational level of the respondents, 27% of the respondents have intermediate education. While 24% have attended school, a high percentage of the respondents (18%) are illiterate. 12% can read and write. 8% have secondary education and another 8% of the respondents have university education and only 3% attended technical/vocational colleges.

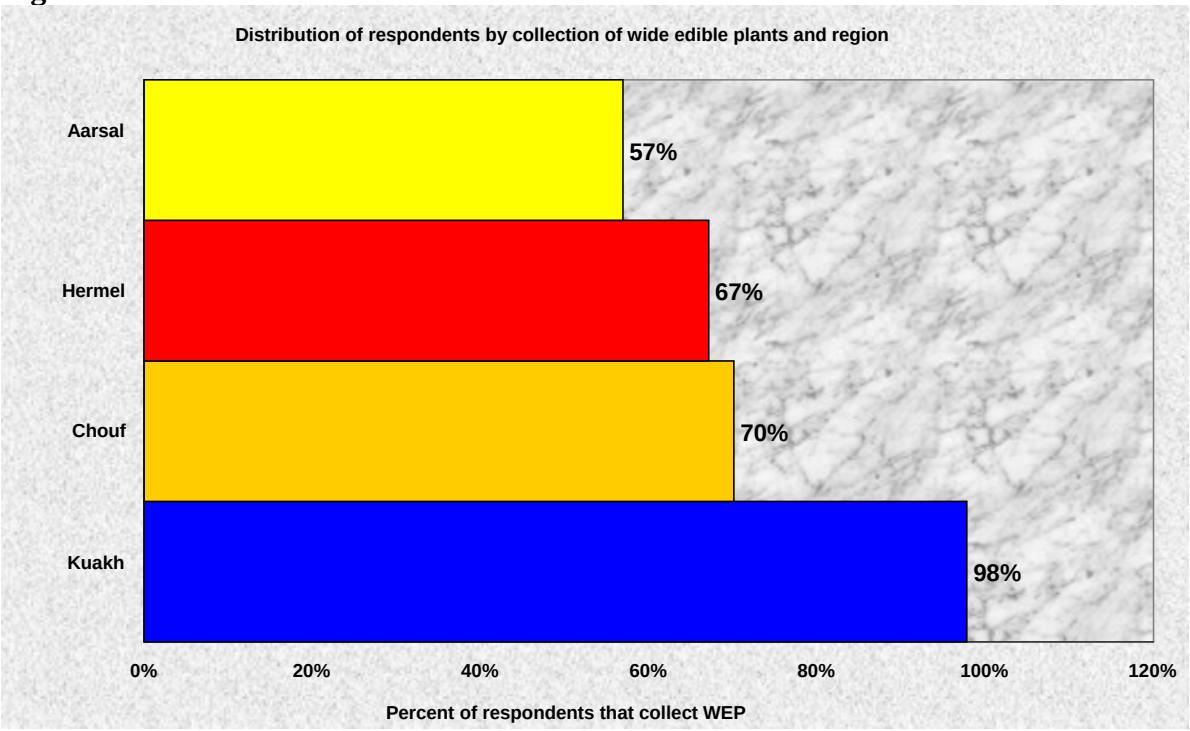
When looking at the occupation status of the targeted communities, data demonstrates that the majority of the respondents are homemakers (43%), reflecting the fact that most women are not employed outside the house. 30% of the population are self employed, while the rest are either farmers (6%), blue collar workers (6%), white collar employees (5%), or other (6%). 3% of the respondents are unemployed, only 2 % of which are currently looking for a job. Figure 17 shows the distribution of jobs among males and females in the targeted areas.

Figure 17: **Distribution of participants by occupation and gender**



Questions regarding practices of collection and use of wild edible plants were included in the survey. Data indicate that 69% of the women collect wild edible plants as well as 62% of the men. Wild edible plant collection according to regions came as follows (refer to Figure18) : 98% of the respondents living in Kuakh collect wild edible plants, 70% of the respondents from Chouf, 67% and 57 % from Hermel and Aarsal respectively collect wild edible plants.

Figure 18: **Distribution of respondents by collection of wild edible plants and region**



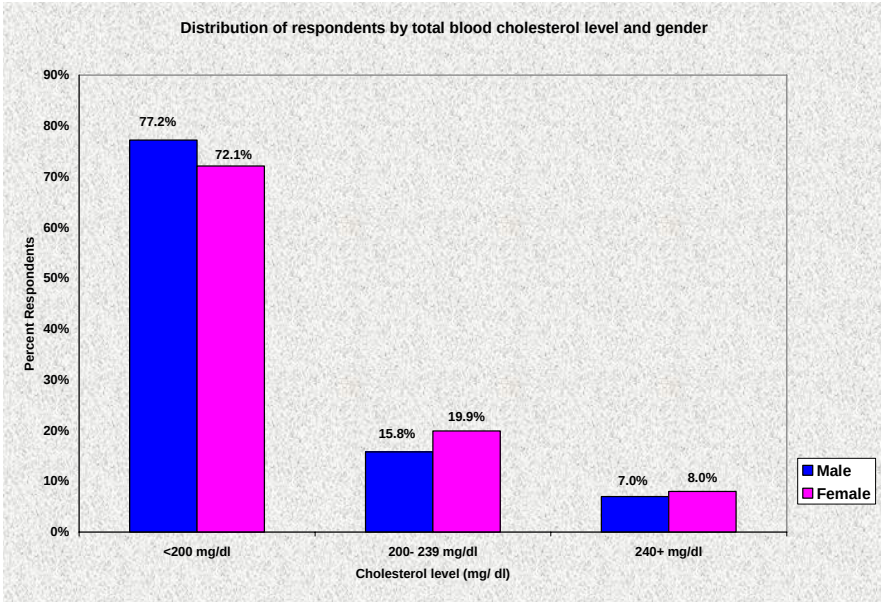
Health status:

When evaluating the health status in the targeted communities, the results draw an alarming picture. There is a surge in chronic diseases in these regions.

The conduction of the survey, in summer of 2005, was accompanied by measurements of blood glucose, blood lipids, hypertension, weight, height, body fat and waist circumference. The results of these measurements were used as health indicators to assess the targeted communities. Our data was compared with a study by Iskandar (2004) carried out across the country, in all six Muhafazat of Lebanon on 501 Lebanese men and women. Results show (Figure 19) that 27.9% of women and 22.8% of men were found to be hypercholesterolemic as compared to national data in 2004 indicating 32.5% and 42.6% respectively (Iskandar, 2004). When looking at our rural data we observe that 65% of women and 61% of men have elevated triglycerides (refer Figure 20) and the previously stated data indicate that 22.4% of women and 52.3% of men have this problem. The prevalence of overweight (25≤BMI≤29.9) and obesity (BMI≥30) was evaluated among men and women and detailed in Figure 21 showing the distribution of BMI (Body mass index) among the respondents. 35.7% of women and 43.9%of men were found to be overweight and 33.9% of women and 17.1% of men were found to be obese. The prevalence of overweight in communities studied by Iskandar (2004) was higher; however, the prevalence of obese women was lower. Hypertension, known as the silent killer, is depicted at higher rates in our study than the national study where 24.9% of men and 25.33% of women versus 23.3% of men and 11.3% of women suffer from hypertension. However the most shocking data is that of blood glucose where only 59.5%

of men and 63.4% of women have normal blood glucose levels, 29.1% and 24% are glucose intolerant and 11.4% and 12.5% are diabetic respectively (Figure22).

<u>Figure 19</u>: Percent Respondents by Total Blood Cholesterol



<u>Figure 20</u>: Percent Respondents by Triglyceride Level

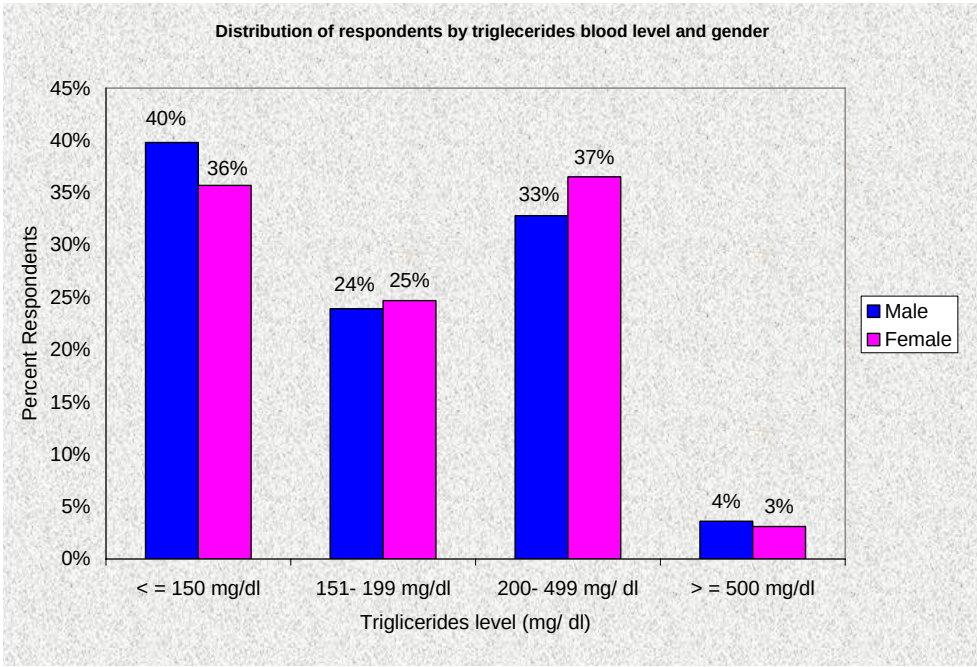


Figure 21: **Percent Respondents by BMI Level**

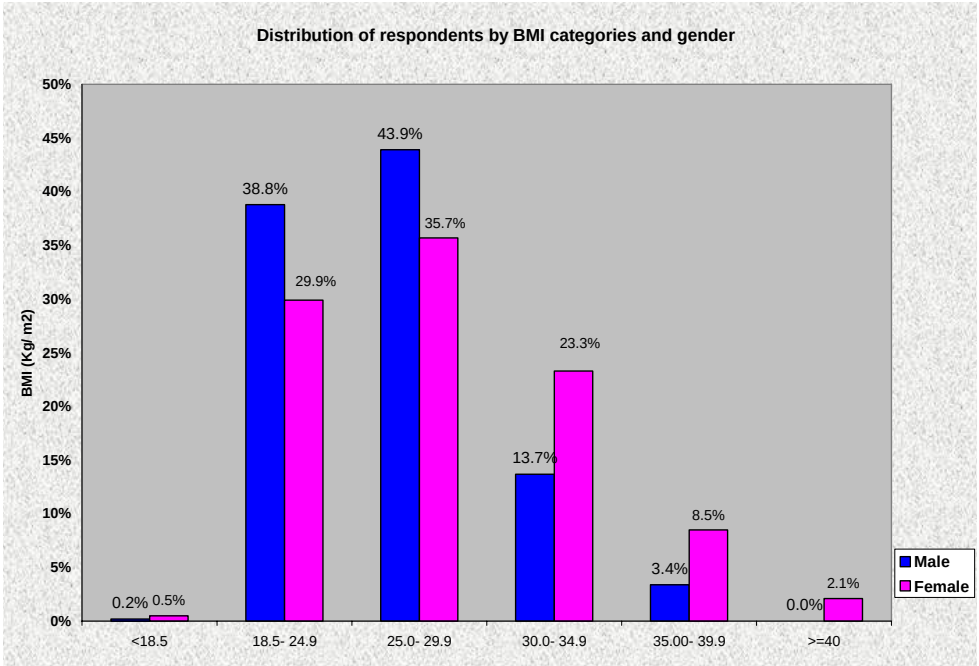
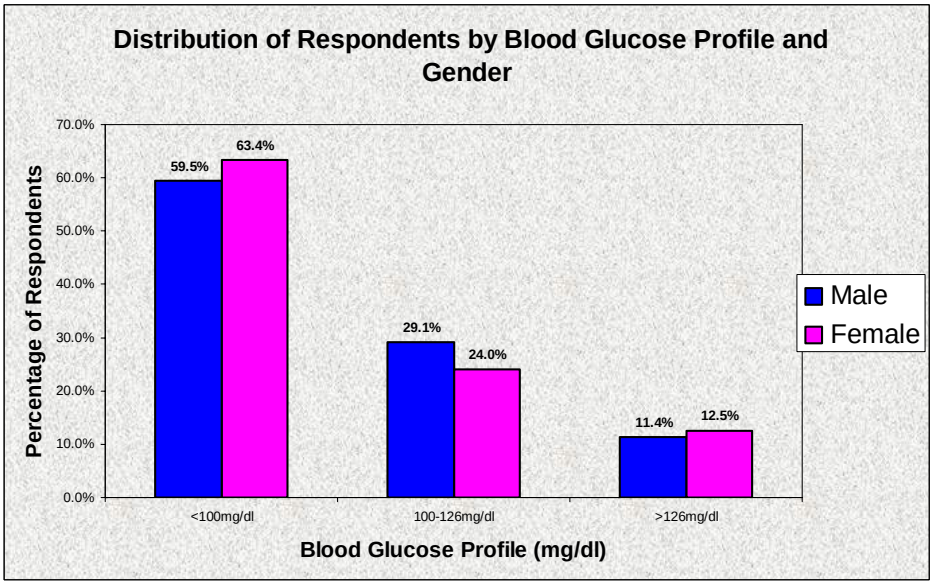


Figure 22: **Percent Respondents by Blood Glucose Level**



Dietary data:

Dietary data reveal a high reliance on starch as an energy source. This may explain the high rate of hypertriglyceridemia and obesity in the target communities. Other problematic information exposed in our results was that of low bioavailability of iron. Iron seems to come mainly from legumes known as non-heme iron which is not well absorbed by the body. However, our data show that protein comes mainly from the meat group making its bioavailability high in the body.

Dietary data was collected by 24 hour recall and food frequency questionnaires. The 24 hour recall is an interview conducted by a trained interviewer using visual references in attempt to define and quantify food intake during a specific day just before the interview. From the 24 hour recall, calculations were done to find out the main source of key nutrients. The results show (Figure 23) that most of the energy (45%) came from the Starch group and the least came from the wild edible plants group (1.1%). It was found that protein, cholesterol and saturated fat came mainly from the meat group whereas fat came from the mixed dish group. When reviewing mineral intake, calcium's main source in the diet was Starch group (36%) and iron came from legumes (40%). Legumes being the major dietary source of iron in the studied communities raise the problem of low bioavailability of iron. This along with the high intake of inhibitors such as tea and coffee may cause problems of iron deficiency and anemia.

Figure 23: Energy Source Distribution per Food Group

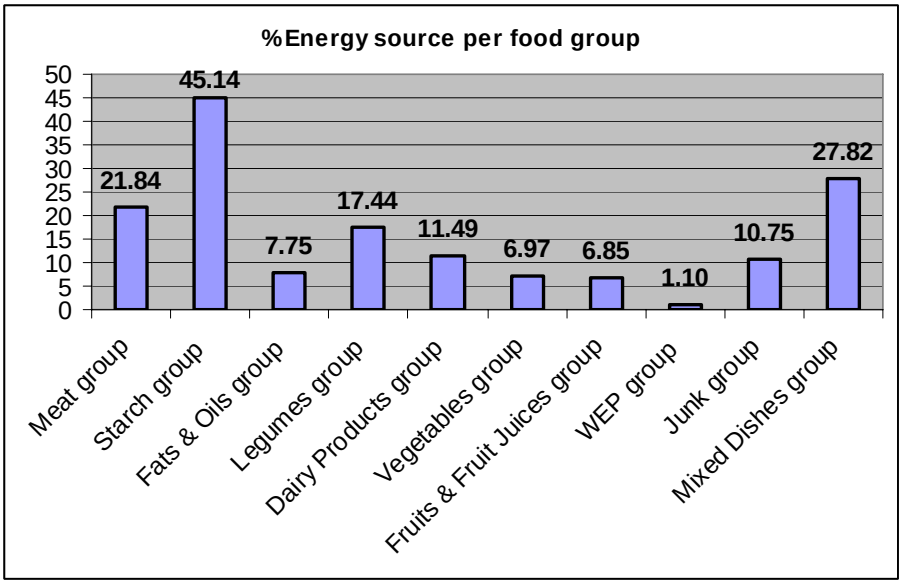


Table 1: Energy intakes and nutrient composition of the diet by Diet Quality Index (DQI) scores*, higher scores represent "good" diets

Nutrients	DQI Score				
	0 N=49	1 N=98	2 N=110	3 N=178	4 N=354
Energy (Kcal)	3011	1877	1929	1997	2198
% Fat	44	44	36	28	19
% Saturated Fat	17	14	10	7	5
% Carbohydrates	37	41	49	58	71
Cholesterol milligrams	667	263	233	277	70
% Proteins	20	16	16	15	14

* DQI points are awarded for diets that derive ≤ 30% of energy from fat, ≤ 10% of energy from Saturated Fat, ≥ 50 % of energy from Carbohydrates, ≤ 300 mg Cholesterol. Maximum total score is 4

Our aim was to study the Dietary Variety and Dietary Quality to draw associations with nutrient intake and health status. The relationship of Dietary Quality Index (DQI) and the nutrient composition of the diet is shown in Table 1. It also shows the mean consumption of Energy, Fat, Saturated Fat, Cholesterol and Carbohydrates at each level of the DQI score. DQI points are awarded for diets that derive ≤ 30% of energy from fat, ≤ 10% of energy from Saturated Fat, ≥ 50 % of energy from Carbohydrates and ≤ 300 mg Cholesterol. Thus, the maximum total score is 4. Subjects with DQI 3 & 4 had diets that were lower in energy, fat, saturated fat, and cholesterol but higher in carbohydrate than subjects with DQI scores of zero. Participants with higher DQI scores are the most frequent in our sample in which 354 of the participants had a score of 4 and 178 participants had a score of 3 as compared to 49 participants who had a DQI score of 0. So we can conclude that the majority of the participants of this study had relatively good diets based on the calculated DQI score.

Table 2: Energy intakes and nutrient composition of the diet by Dietary Variety Score; higher scores denote greater variety

	Dietary Variety Score Range (Number of Foods)		
	0 to 3 N=188 Mean	4 to 6 N=526	7 to 9 N=75
Kilocalories per day	2385.37	2021.14	2208.98
%Calories from Carbohydrates	64	57	56
%Calories from Proteins	14	15	15
%Calories from Saturated Fat	8	8	9
%Calories from Fat	28	28	30
Cholesterol milligrams per day	196.42	205.24	174.02
Vitamin A RE per day	1179.92	917.49	823.21
Sugar grams per day	42.46	45.23	49.95
Dietary Fiber grams per day	27.46	20.98	21.63

Table 2 shows the relationship between Dietary Variety Score (DVS) and nutrient composition. DVS is calculated based on the number of food groups eaten per day. The food groups were: Meats, Starches, Fats and Oils, Legumes, Dairy Products, Fruits and Fruit Juices, Vegetables, Wild Edible Plants, Junk Food and Mixed Dishes. Each person who consumed from the Mixed Dish group got a score of 3 because most of the mixed dishes encountered in the diets were made up of an average 3 food groups. People consuming from the Junk group were given a score of -1 due to the negative quality it entails. Since Dietary Diversity and Dietary Quality are related as stated by Ruel (2003), counting junk food as part of diversity would blur the intended association between variety and possible health benefits. All the other food groups were given the score of 1. Thus, the total dietary variety score of a person consuming from all the stated food groups is 10. However, the highest DVS in our sample was 9. Higher values of DVS were associated with increased intake of Vitamin C ($r = 0.169$, $P < .05$), Protein ($r = 0.15$, $P < 0.05$) and reduced intake of Saturated Fat ($r = -0.158$, $P < 0.05$). However; no significant correlations were observed between DVS and the consumption of Energy,

Carbohydrates, Fat, Cholesterol, Vitamin A, Sugar or Dietary Fiber. Also no significant relationship was observed between the present DVS and the DQI.

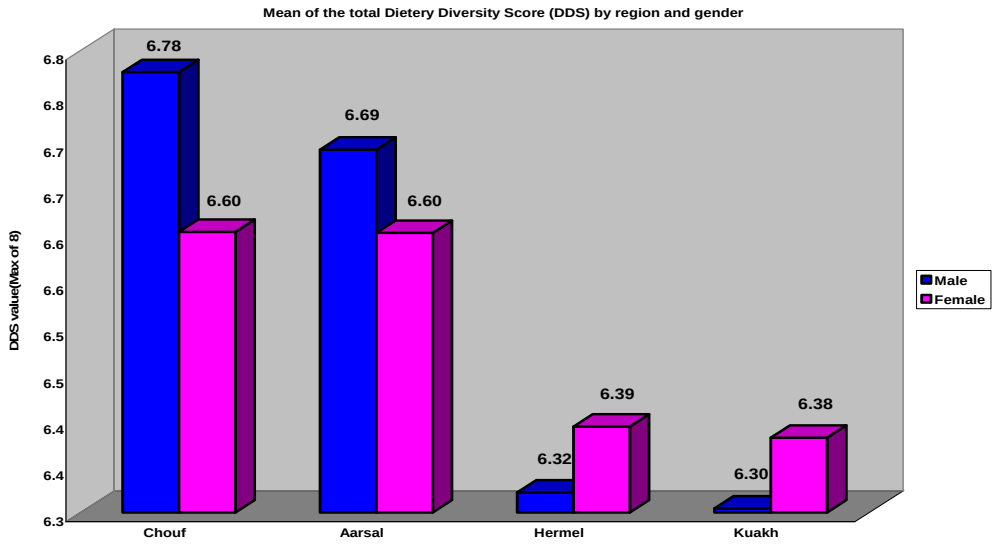
This Dietary Variety Score was compared against the body measurements taken using Pearson correlation. It was found that there was no significant correlation between the diversity of the diet and BMI, waist circumference, % body fat, cholesterol, and blood pressure of participant. However, there exists a significant positive correlation between the diversity of the diet and the level of glucose of the blood of the participants($r = 0.75$, $P < 0.05$).

From the food frequency questionnaire, the second source of dietary data, dietary diversity was calculated based on food groups and food items.Dietary diversity is commonly measured by counting the number of different foods or food groups consumed over a certain reference period. Some studies have shown food groups to be more highly significant than food counts (Ruel, 2003).

The food frequency items score, which gives us a score of total number of different foods consumed by each individual, is based on the food frequency questionnaire in which people were asked how often they consumed a list of foods. This was converted to useable numbers by reducing all answers to daily equivalents. For example, if someone says they eat tomatoes every day, they have a score of "1"for tomatoes. If they said they eat red meat twice a week, they get a score of 2/7 (0.285).

A second score, based on food groups, was done by choosing 8 food groups each receiving a score of 1. The food groups identified were: Meats, Starches, Fats and Oils, Legumes, Dairy Products, Fruits and Fruit Juices, Vegetables and Wild Edible Plants. A person who ate an item from one of those categories once per week or more received a score of 1. Foods which don't enter in one of the categories (drinks other than milk or fruit juices, sweets and desserts, chips etc) received a score of zero. Results of the dietary diversity score based on the food group show that the average score was 6.5 over a total score of 8. There was no significant regional or gender difference for the diversity score calculated from the FFQ as shown in Figure 24.

Figure 24: Mean Dietary Diversity Score by region and gender



Food security:

Results obtained for food security are surprisingly low with respect to typical response rates in other countries and what we know about poverty in the three rural communities. Possible under-reporting and social coping mechanisms need to be further investigated. It seems clear that when faced with food shortages, people are indeed sacrificing dietary diversity. Our analysis suggests that increasing dietary diversity is a good way to offset food insecurity in rural Lebanon. The correlation of wild plants with food insecurity may indicate that they are already providing some protection against periods of food shortage.

Food security questions were both quantitative (asking whether respondents ever lacked quantity of food) and qualitative (asking whether they lack the quality of food desired). The questions were combined such that anyone who answered one of the six clear quantitative food security questions positively was categorized as food insecure, approximately 18% of respondents are considered "food insecure" versus 82% who are "food secure". However, only 5% said they ever skipped a daily meal because they didn't have enough food or money to buy food. Numbers of respondents experiencing qualitative food insecurity were higher, as shown in Figure 25. The number of food groups consumed was positively correlated with food security, a finding consistent with the literature on dietary diversity (Ruel 2003; Hoddinott 2002). When food ran out, the most frequent coping strategies reported were to substitute less expensive foods with cheaper options, reduce the variety consumed, and collect from the wild or garden (Figure 26).

Cross-tabulation indicates a negative correlation between food security status and wild edible plant collection. Our analysis so far does not allow us to conclude whether

collection of wild plants provides protection against food security or rather that people suffering food insecurity resort to wild plant collection.

There was no correlation found between self-production and food security status. However, when those who skipped a meal or a day of eating were asked if it was in a specific season, of the 31 who answered, 27 (87%) answered that it was during winter.

Figure 25: Subjective Food Security

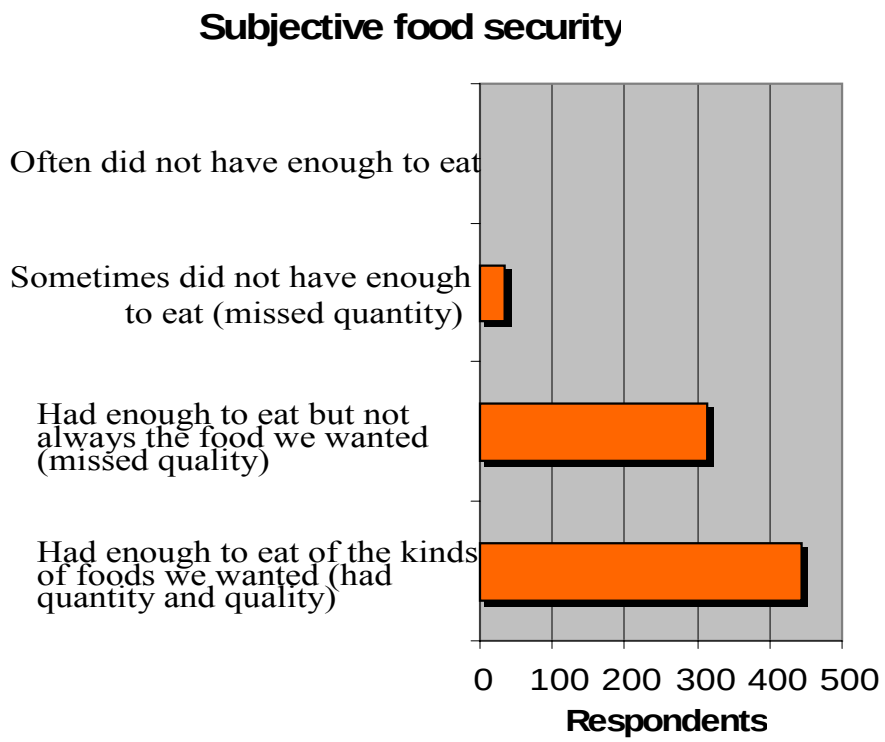
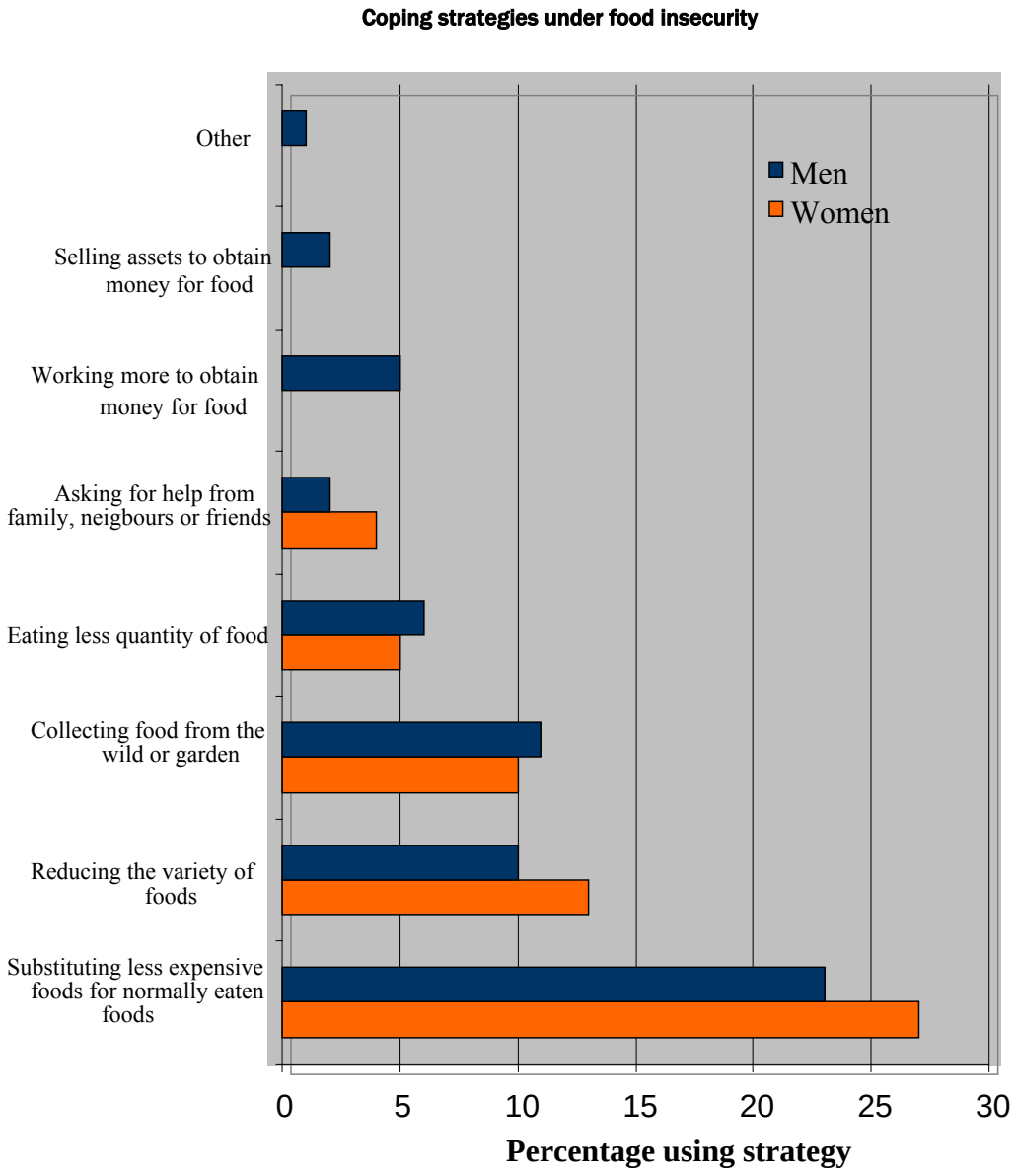


Figure 26: Coping Strategies for Food Insecurity



In order to assess the cost of a typical weekly diet and a suggested healthy diet in the selected regions we used the 24 hour recall and a market survey to formulate Food Baskets. These baskets are costing tools which are carried out and used by local, provincial /state and national governments. In Canada, the Montreal Diet Dispensary has been costing food baskets since 1948. For our study, prices and availability of food sold on the retail market in each of the rural communities was evaluated and the cost of both a normally-consumed basket of food and a nutritious food basket was calculated using the below mentioned methodology.

First, interviews were conducted with one focus group from each rural community with the objective of better understanding where people obtain their food. Then, prices and availability of items were checked in a total of 43 stores during the period between June 15 and July 15, 2005. The lowest price of each item was recorded as the reference price.

The market survey was used for the construction of two food baskets, a Normal Basket representing usual consumption of the population surveyed, and a Healthy Basket.
The Normal Basket was made up of the top 50 most-consumed foods, based mainly on the results of a non-quantitative food frequency questionnaire (FFQ) which was quantitated post hoc using 100 24-hour recalls. Answers about how often people consume a food in the FFQ (times per day, week, month or year) were converted to daily equivalents. The 50 items with the highest daily equivalents were included in the Normal Basket.
Next, a Healthy Basket was constructed by substituting items considered to be unhealthy (i.e. items high in saturated fats, sugar and salt and low in fiber) with other items, and cutting down on items considered to be grey-areas in terms of health such as coffee and tea.

We attempted to minimize the changes in the pattern of food consumption, replacing for example full-fat labneh (strained yogurt) with low-fat and sugar-sweetened juice with 100% natural juice. While maintaining serving sizes, the following changes were made:

- Sugar was reduced in quantity from 2.88 servings to 1 serving per day
- Coffee was reduced in quantity from 1.52 servings to 0.5 serving per day
- Tea was reduced in quantity from 1.36 servings to 0.5 serving per day
- Whole milk was increased in quantity from 0.3 servings to 1 serving per day
- Full fat labneh was substituted by low fat labneh
- White Arabic bread was substituted by whole wheat Arabic bread (though some whole wheat bread was already in the normal diet)
- Vegetable oil (corn) was substituted by olive oil (though some olive oil was already in the normal diet)
- Mixed nuts was substituted by unsalted peanuts
- White rice was substituted by burghul
- Soda was substituted by fresh juice (though some orange juice was already in the normal diet)
- Chocolate was substituted by dried apricots (the most common dried fruit)
- Processed yellow cheese was substituted by white cheese.

Thereafter, items in the food baskets were quantified based on a sample of responses from the 24 hour recall section of our survey. In the interest of simplicity, it was decided to make a genderless 'adult' basket based on the average amounts of male and female consumption.

Finally, the cost of the food basket was calculated using prices obtained in the market survey. Prices were calculated based on the average of all stores surveyed in each of the three regions, such that a comparison can be made between regions. The final basket cost presented is based on an average of the costs in the three regions.

Results of nutritional analysis revealed that the regular basket is already relatively 'healthy' and diverse. The methodology used for creating the baskets proved to be successful, based on the fact that total calorie counts are close to the recommended daily allowances and are also similar to previous findings in studies of the Lebanese diet (Table3).

Table 3: Net energy per capita per day in Lebanon, 1961-2005

/capita/day	*1961-63**	*1971-73**	*1981-83**	*1990-92**	*2001***	*2005****
Calories	2396	2319	2844	3144	2523.5	2257

* Hwalla (Baba), 1998.
**Nasreddine, 2006
*** Regular Basket

It is however important to note that our methodology only approximates actual average intakes, as it is based on an un-quantified food frequency questionnaire complimented by a sample of 24-hour recalls.

Nevertheless, comparison of nutrient analysis of the normal basket with recommended daily allowances from the United States suggests that diets in our communities are already adequate, as the normal basket nearly reaches or exceeds the average Dietary Reference Intake (DRI) for this age group in all categories of nutrient content except calories, of which it has a lower level (see Table 4). Saturated fat content should represent less than 7% of caloric intake as recommended by ATP III (NCEP, 2001); this target is not reached in the normal basket where saturated fat is at 8.4% and is under the mark for the Healthy Basket (6.2%)

It is clear that the healthy basket has a healthier profile than the normal basket. It has substantially lower levels of saturated fat and caffeine. Calories are slightly higher than in the normal basket, but still lower than the DRI. The healthy basket also has higher levels of dietary fiber, vitamin B12, folate, vitamin C, iron, magnesium, zinc and calcium. Vitamin A is however slightly lower in the healthy basket, due to lower levels of vitamin A in low-fat labneh. Overall, it seems that relatively small changes in the basket make important nutritional improvements. Table 4 shows a nutritional comparison between the normal basket, the healthy basket and the dietary reference intakes recommended.

Table 4: Nutritional evaluation of baskets

Basket Analysis			
Nutritional comparison for Daily intakes			
	Normal Basket	Healthy Basket	Average DRI*
Calories (Kcal)**	2257	2370.9	2471.5
Saturated Fat (gm)	21.1	16.5	
Niacin (mg)	25.1	26.1	15
Total dietary Fibre(gm)	27.6	47.5	28.5
Vitamin C (mg)	158.5	196.9	82.5
Vitamin A (retinol equivalent)	1135	1092	800
Vit B12(µg)	2.3	2.7	2.4
Folate(µg)	425.7	605	400
Iron (mg)	12.7	23.3	10.5
Magnesium (mg)	438.5	662.8	370
Zinc (mg)	13.5	18.6	9.5
Calcium (mg)	1114	1198.3	1100
Caffeine (mg)	181.6	62.2	

*Average Dietary Reference Intake is calculated from the average of four categories: male-31-50, male-51-70, female-31-50, female-51-70) in the Dietary Reference Intake series, National Academies Press. Copyright 1997, 1998, 2000,2001,2002,2004, by the National Academies of Sciences.
** Caloric requirements are Estimated Energy Requirements based on the average of requirements for 40 and 60 year old males and females.

In spite of the important nutritional improvements of the healthy basket, the price difference with the normal basket was small. The average price difference was roughly 1700 LL (1.7 Canadian dollars) per week, per household and represents a cost increase of 5.6% over the normal basket. Table 5 shows a comparison between the costs of the baskets in the three studied regions. The normal basket costs the most in the Hermel region whereas the healthy basket costs more in Chouf.

Table 5: Comparison of basket cost between communities

COST	*Aarsal*	*Hermel*	*Chouf*	***Average***
Weekly Cost Normal Basket (LL) - average adult	27020	30109	28625	**28576**
Weekly Cost Healthy Basket (LL) - average adult	27073	30249	33567	**30297**

V. Fulfillment of objectives

a. **General objective:**

Improvement of the health status of the rural and urban poor through the promotion of the preservation and sustainable use of wild plants at the national and regional levels using culturally appropriate and sustainable practices to reverse unhealthy reliance on refined grains especially among the urban and rural poor and investigation of policy options to improve dietary diversity with governments, non governmental organizations, community based organizations based on incorporation of wild edible plants in the diet.

This objective has been achieved through the accomplishment of all the specific objectives listed and explained below.

b. **Specific objectives** :

i. *Development of an in depth understanding of the role of indigenous knowledge about wild plant identification, collection, and usage in improving health with attention to the recording and dissemination of traditional methods of identification, sustainable harvesting, and consumption* (achieved).

The development of an understanding of indigenous knowledge about wild plants has been established through several activities. Three Masters theses have recorded IK of wild edible plants. Information on the collection, uses, preservation methods, ways of consumption, and benefits of wild edible plants was gathered. Moreover, nutrient analysis was conducted on 21 plants. A report entitled "Surveying and Monitoring Wild Edible Plants" discussed ways of identification, sustainable harvesting, and possible domestication of wild edible plants. An important outcome of the project was the Wild Edible Plants Database which includes unprecedented information on various plant characteristics. In order to disseminate the compiled knowledge two cookbooks were published to promote the use and advantages of these plants. The website of the WEP-DD is a vital way of spreading our data, findings, and experiences.

ii. *Assessment of nutritional and health status in the surveyed communities and assessment of intersectorial linkages including sociocultural, nutritional, health and current policies related to biodiversity and dietary diversification and investigation of policy options to promote dietary diversification and rural development and capacity building through analysis of production, marketing and other factors that contribute to the availability of and access to a diverse diet*.(achieved)

1000 questionnaires were conducted in 3 rural communities and one urban community. Measurements of various health indicators were taken and assessed against reported health status. In addition, information on family history and health were used to evaluate the target communities. Dietary intake was assessed by carrying out a food frequency questionnaire and 24 hour recall which gave a clearer image of the nutritional status in these populations. As for the policy implications of this project, policy discussions started at the Regional Biodiversity Workshop.

Then, preparation of a policy profile commenced promoting dietary diversity in poor communities through the use of wild edible plants. It was evident that very few and insufficient policies existed that directly target wild edible plants. This policy report was then prepared into a policy brief that can be presented to policy makers in Lebanon. Capacity building of the communities through the use of wild edible plants occurred by setting up a kitchen in each community that functions under the name " Healthy Kitchen" and caters local traditional foods. A marketing analysis on this network of kitchens was detailed in a report describing pricing, advertising, public relations, sales channels, and distribution strategies that need to be implemented as a possible outcome of phase two of this project.

iii. *Undertake a program of promotion of wild plants to improve dietary diversity at local and national levels and evaluate the impact of the program on the improvement of economic and health conditions of the rural poor, including the women and development of appropriate community based technology to improve micronutrient profile of staples.*(achieved)

Locally, cooking festivals were launched in the villages of Aarsal, Kfar Nabrakh, Kuakh in addition to the urban community: Burj el Barajni Palestinian refugee camp where women from the communities were invited to present dishes based on wild edible plants and share their knowledge regarding them. Nationally, the set up of the Healthy Kitchen network encouraged the use of wild edible plants. These kitchens employ women from the communities giving their skills an added value. The WEP-DD had extensive media coverage through 4 television appearances, 2 newspapers, and 2 magazines.

iv. *Capacity development at the academic and local levels in the region (Lebanon, Syria, and Jordan) and at the global level (through partnership with IDRC-funded projects in Sub Saharan Africa) with emphasis on improving communication skills and the setup of a scientific network dedicated to the study of wild plants as food with potential medicinal value.*(achieved)

The project offered an opportunity for dialogue and exchange at the academic level. Several meetings (including the regional workshop) were held and discussion around the objectives of the project was carried out with various stakeholders. Valuable partnerships were initiated with two universities in Canada, the IPGRI (now Biodiversity) researchers in both Kenya and Italy, and universities in Jordan and Yemen.

VI. Project design and implementation

Activity 1: Good Manufacturing Practices (GMP) and Good Hygienic Practices training (GHP)

This was a three day training that took place at the American University of Beirut, Department of Nutrition and Food Science from May 30th till June 1st 2005. The trainers, Mrs. Basma Hamadeh and Ms. Wilma Zaccour, conducted a workshop on Good Manufacturing and Hygienic Practices. The 21 attendees were women of Healthy Kitchen

(Aarsal, Kuakh, Chouf and Burj el Barajneh communities) and youth of Healthy Kitchen (Kuakh and Burj el Barajneh). This training included collection and preparation of selected recipes.

Activity 2: Set up of the Healthy Kitchen

After the training on the GMPs and GHPs, the women of these communities were ready for the launching of the Healthy Kitchen. These kitchens were set up in Batloun, Aarsal, and Kuakh and functioned as catering facilities providing traditional healthy food. The set up of these kitchens took the whole course of the project starting from April of 2005 till March of 2007. The kitchen facility was supported by the project providing them with electrical supplies, kitchen appliances, kitchen furniture, utensils, and in some cases renovated the whole kitchen. This project increased women's empowerment and developed their nutritional knowledge regarding healthy food preparation methods. Financially, it resulted in some profit as the kitchen catered for various occasions such as workshops at AUB and social occasions in the communities.

Activity 3: Data collection

An extensive questionnaire (Appendix 7-arabic version, Appendix 8- English version) was conducted during the summer of 2005 from the villages of Hermel, Kuakh, Aarsal, Batloun, Kfar Nabrakh, and Warhaniyeh. The questionnaire gathered information about health, income, food security and dietary habits. Measurements of health indicators were taken. In order to make the collection acceptable in these communities, it was decided to employ interviewers from the communities themselves. Interviewers were trained at the university on data collection prior to initiation. However, some problems arose from hiring non nutritionists especially when collecting dietary data and taking measurements. This led to the repetition of several questionnaires to get the best quality of data. Thus, to avoid such problems we would consider having a higher budget for data collection in the second phase of the WEP-DD to be able to hire trained professionals. A fourth urban area was added to the proposed communities. Two hundred individuals were supposed to be surveyed in the Beirut suburb of Wata el Mouseitbeh inhabited by migrants from the Chouf area. It was hypothesized that the nutritional and epidemiologic transition undergone by these populations could be better understood. Data collection in this suburb faced a high refusal rate. It is believed that security concerns in urban areas prevent people from accepting to receive interviewers in their homes (despite the support

provided by the mayor of the neighborhood). Moreover, due to the summer war of 2006 we were able to survey only 47 people then work in this suburb was halted. After the war ended we approached the urban setting in a different perspective. Instead of approaching people at their homes, we recruited them in their work place by contacting 4 companies who allowed us to interview their employees. A total of 178 urban questionnaires were collected through this approach.

Activity 4: Regional Biodiversity Workshop

This workshop took place February 3-5, 2006 at the American University of Beirut. The focus of this workshop was on Indigenous knowledge regarding identification and use of wild edible plants, the setup of a regional database on wild edible plants including all relevant scientific knowledge and the investigation of policy options for wild edible plants in improving dietary diversity and food security at the regional level. Lectures were given by Dr. Batal (A.U.B), Ms Ajawi (Local Links), Dr. Bordoni (Global Facilitation Unit for Underutilized Species), Dr. Al Eisawi (University of Jordan), Dr Maundu (IPGRI, Nairobi), and Dr. Takruri (University of Jordan). This workshop included 3 group discussions and a trip to one of the communities (Batloun).

Activity 5: Surveying and Monitoring of Wild Edible Plants

During the year 2005 till 2006, several activities were performed in order to formulate the report entitled "Surveying and Monitoring of Wild Edible Plants". Surveying and monitoring took the biggest portion of the time and first used a qualitative method by collecting information from the rural people on why, how, where and how much these plants are useful for their livelihood, stability and sustainability of their rural areas. Then, a quantitative approach was taken and included data recording of site location, elevation, physiology, habitat, microenvironment, soil drainage, soil texture, stoniness, population density and spatial distribution of target plant species. As part of this report, seed viability and germination trials were planned but due to the war in the summer of 2006, domestication trials on aquatic plants were carried out but other domestication plans were halted.

Activity 6: Policy research

An investigation of the policy environment regarding biodiversity, dietary diversity and nutrition was carried out with the aim to develop a policy brief to promote dietary diversity. People contacted were those involved in work on biodiversity in Lebanon. For this reason, a list of contacts of the attendees of the "Biodiversity as Food" workshop at the AUB was provided, and appointments were arranged. Promoting the use of wild edible plants could be directed at different purposes, such as cultural (eco-tourism, preservation of tradition, etc.), agricultural (nutrition, biodiversity protection, etc.), health (health benefits of wild edible plants), economic (alleviating the conditions of the poor in rural areas), industrial, and so on. For this reason various ministries were targeted such as: Ministry of Environment, Ministry of Agriculture, Ministry of Tourism, Ministry of Public Health, Ministry of Culture and Higher Education, Ministry of Economy and Trade, and Ministry of Social Work. As for NGOs, several private organizations contacted were Green Line, World Vision, SRI International, and Mercy Corps. The process of researching for the policy report ended in June 2006.

Activity 7: Standardization of recipes for cookbook

As means of spreading the knowledge and encouraging the use of wild edible plants two cookbook were prepared. For "*The Healthy Kitchen: Recipes from Rural Lebanon*" cookbook, women (total of 6) from Batloun, Aarsal, and Kuakh standardized their traditional recipes under the supervision of a dietitian at AUB.

Activity 8: Association formed with Canadian and French universities

Our research project made a link with two universities in Canada; McGill University and Université Laval , and France, Université de la Méditerranée Faculté de Médecine de la Timone – Marseille. Three Masters' students studying in Canada did their theses and project work in Lebanon on the WEP-DD. The topics of these graduate students include: "Use, Consumption and Health and Medicinal Properties of Six Species of Wild Edible Plants In the Northeast of Lebanon" , "Effect of non-nutrient carotenoids on the incidence of age-related cataracts in poor areas in Lebanon", and " The Economics of Dietary Diversity Food security, diet and agrobiodiversity in rural Lebanon". Also, through a PhD thesis (What is a healthy diet in Lebanon and how much does it cost? A

rural vs. urban comparison), collaboration was established with a French nutrition research center (INSERM_INRA- Université de la Méditerranée)

Activity 9: Media Coverage

Malek Batal and other project stakeholders such as Mrs. Khadijeh Chahine, Ms Lara Ajawi, and Ms Zeinab Iskandar appeared on four television shows explaining the project objectives, activities and results. The press closely followed up on WEP-DD such as Annahar (Appendix 9) and Daily Star newspapers (Appendix 10), and Afkar (Appendix 11) and MainGate magazines (Appendix 12)

VII. Project outputs and dissemination

A. Knowledge creation outputs:

Output 1: Setup of wild edible plant database (Appendix 13)

A database was initiated containing specifications for 46 plants. Information about the plant species was compiled regarding the common Arabic and English names, Scientific, and family names. Then a brief description of the plant, its habitat, locality and seasonality were added. A deeper look at each plant in terms of its active compounds, therapeutic uses and the indigenous knowledge of the communities about it has been reviewed and incorporated. In addition, a section about the consumption methods and edible parts of these wild edible plants was included. This database is rich with pictures and information. Wild plants from Jordan and Syria were added. .24 plants were included from Lebanon, 7 from Jordan, and 12 from Syria. The data from Jordan was given in the regional workshop done in February 2006 by partners at the University of Jordan (Drs. Eisawi and Takruri) and the document from Syria was sent by email by Dr. Sohil Makhoul, involved in the agrobiodiversity project funded by UNDP and GEF.

In the process of compiling this information, several challenges were encountered such as the lack of plants availability to ascertain taxonomy (knowing that wild edible plants are seasonal). Additionally, finding the scientific nomenclature of different plants posed a great challenge since some distinct plants have the same local names and the same plant might have different local names.

The work on the database should be continuous and more work is needed in order to obtain a comprehensive database containing a wide variety of local plants.

B. Training outputs

Output 2: Masters' thesis reporting on indigenous knowledge about wild plants use, harvest and health claims, and nutrient analysis

A Masters thesis entitled "Analysis of Indigenous Nutritional Knowledge, Cultural Importance, and Nutritional Content of Wild Edible Plants" (Appendix 14) was submitted

in June 2006 based on information collected in the WEP-DD. This study portrays the relative cultural and nutritional importance of wild edible plants in 3 rural communities in the Bekaa (Hermel, Aarsal) as well as in the Chouf region in Lebanon. A qualitative method (focus groups and key informants questionnaire) was used to gather information regarding the different uses of wild edible plants, their preservation, benefits, nutritional benefits and methods of consumption and collection as well as indigenous knowledge. Moreover, nutritional analysis of 20 wild edible plants was completed to measure the accurate amount of macronutrients and minerals present in these plants. It was found that wild edible plants consumption is very popular in rural communities. Many plants were referred to and recognized as possessing many therapeutic and nutritious properties. Plant collection, is still practiced by many individuals. The nutritional analysis of these plants showed that some of the participants overestimated the nutrient value of the plants. However, in other cases some plants showed higher nutritional value than what was indicated by the subjects.

Output 3: Masters Project "Use, Consumption and Health and Medicinal Properties of Six Species of Wild Edible Plants in the Northeast of Lebanon" (Appendix 15)

The research area included a total of eighteen towns/villages of north east Lebanon. The villages fall in the Bekaa Valley. A structured, semi-qualitative questionnaire was used to collect data with thirty participants interviewed. Six species of WEP were identified as integral to the diet of rural Lebanese communities. The identified species were: *Cichorium intybus*, *Eryngium creticum*, *Foeniculum vulgare*, *Malva sylvestris*, *Thymus syriacus* and *Gundelia tournifortii*. Data concerning familiarity, consumption, trend of consumption, preparation and preservation methods, and perceived significance of these plants focusing on their medicinal benefits was analyzed.

Most informants consumed the 6 plants as a regular part of their diet. Seasonal variability in consumption was evident. *C.intybus* was renowned for its digestive and blood strengthening properties. *F. vulgare* was used as a digestive stimulant. *M. sylvestris* was distinguished for its anti-inflammatory qualities. *T. syriacus* was popular for its digestive and anti-poisonous properties. *E. creticum* was attributed less pronounced health benefits. *G. tournifortii* was considered a nutritious food. All 6 species were popular for their

edible uses as well as their health and/or medicinal benefits. These properties are supported by scientific evidence. Our results highlight the importance of these plants for local people and support efforts for their conservation. However, we noticed a decline in indigenous knowledge. We urge efforts in recording it for other plants and in other communities.

Output 4: Masters Thesis "Assessing the Current Use and Significance of Wild Edible Plants Traditionally Gathered in Lebanon: An Ethnobotanical Study" (Appendix 16)

An ethnobotanical study was conducted in rural Lebanon between 2002 and 2004. WEP-DD contributed to this Masters Thesis during the writing and analysis phase. WEP-DD also used the lists compiled by this project as the skeleton of the wild edible plants database mentioned earlier. Twenty-five key informants from fourteen towns and villages were interviewed using a semi-structured questionnaire, the objectives being to find out which wild edible plants are currently known and used and what these plants signify for the users. The informants interviewed mentioned more than 30 edible plants, and described their gathering activities as well as the various methods of preparation involved. We were able to identify 32 of these plants belonging to 18 botanical families. In the past,
Lebanese rural communities needed to rely on these plants to supplement their diet in the absence of irrigated agriculture and in times of food shortages. Informants considered that nowadays knowledge and use of these wild edible plants represent an important cultural heritage, a natural, tasty and health promoting addition to meals, and considered gathering to be an enjoyable social activity during the spring months. In addition gathering activities increase for certain Christian communities during Lent.
However and in spite of a renewed interest in these plants (triggered by the fear of pesticides and other chemicals), traditional knowledge and gathering of these plants has largely declined during the last four decades. The informants identified factors threatening the state of knowledge of these plants and their use, such as the advancing age of knowledgeable people, urbanization and acculturation, pollution and abandonment of traditional management techniques, and the effect of the Lebanese civil war. The availability of some popular edible species such as *Gundelia Tournefortii* may be threatened by over harvesting.

Output 5: Masters Thesis "Effect of non-nutrient carotenoids on the incidence of age-related cataracts in poor areas in Lebanon" (Appendix 17)

The main objectives of this study are to assess the relationship between lutein and zeaxanthin intake and age-related cataracts, and also to determine the factors that come into play in wild leafy edible greens consumption. The study followed a case-control design and took place in Hermel, a poor rural area located in the northeast of Lebanon. It was conducted among participants aged 45 years and above, and native and resident of Hermel. These participants were located through an eye clinic and word-of-mouth. For each participant with age-related cataract there was a control of the same age, gender and region, who has visited an eye clinic for a check-up but has been tested negative for any

eye disease. Two questionnaires were administered to each of the participants. The first collects socio-economic data and includes a semi-quantitative 7-day food frequency questionnaire in order to accustom the participants to the study as well as to assess dietary consumption of lutein and zeaxanthin, and consumption of wild leafy edible greens. The second consists of a semi-quantitative 3-month food frequency questionnaire that aims to validate the data obtained from the first questionnaire. The average consumption of lutein and zeaxanthin in the diets of the controls was calculated and compared by Student's t-test to the average consumption of lutein and zeaxanthin in the diets of the cases. The study should lead to a better understanding of the role of lutein and zeaxanthin in preventing age-related cataracts and should promote the consumption of wild leafy greens. This thesis is expected to be defended during the fall of 2007.

Output 6: Masters Thesis "The Economics of Dietary Diversity Food security, diet and agrobiodiversity in rural Lebanon" (to be published soon)

This research examines the linked issues of household food security, dietary diversity and consumable agrobiodiversity in the context of three poor rural communities in Lebanon, during the years 2005-2006, at a time of rapid and possibly double-edged globalization. The central question is whether there is a trade-off between food quantity and food quality in the attempt to achieve food security and what the economic reasons for such trade-offs are. Do people sacrifice quality of food, and particularly food diversity, in order to avert hunger or cut their costs? Do those who gather or grow their own food make this trade-off more, less, or differently? What policies, particularly agricultural and trade policies, may be interacting with household decisions to reduce biodiversity and dietary diversity? The results and conclusion of this thesis are not yet available.

Output 7: Masters Thesis "Development, Implementation and Evaluation of a Nutrition Education Tool to Target Chronic Disease Risk Factors in a Lebanese Rural Community". (Appendix 18)

Due to the lack of any program targeting emerging chronic diseases in the country, the following thesis project will seek to test the effectiveness of a nutrition education tool to target chronic disease risk factors in a confined rural setting. The ultimate aim is to propose the development of a nutrition education program to combat chronic diseases nation wide.
The objectives of this thesis project are to a) pretest the nutritional knowledge of Batloun community in the Chouf region in Lebanon b) pretest the nutritional knowledge of health care professionals in the community and in a nearby private hospital c) develop and implement a nutrition education tool to target the determinants of chronic diseases in the community d) educate physicians on current nutritional issues related to chronic diseases e) develop a practical tool for nutritional assessment by health care professionals f) evaluate the education regime by post-testing the nutritional knowledge of the community. The status of chronic disease risk factors, like BMI, blood lipid profile and smoking habits of the community will be obtained from phase I of WEP-DD. This thesis is expected to be defended during the fall of 2007.

Output 8: PhD Thesis "What is a healthy diet in Lebanon and how much does it cost? A rural vs. urban comparison." (Appendix 19)

The thesis project is divided in two parts. In the first part, the food consumption patterns, nutritional intakes and diet quality of adult rural vs. urban populations living in Lebanon will be studied, the adherence to the traditional Mediterranean (Med.) diet in these urban and rural populations will be estimated, and finally the relationship between different dietary quality indices, including the Mediterranean scores and major CVD risk factors in these populations will be analyzed.
In the second part, the relationship between diet cost and different dietary quality indices, including the Med. Scores, will be analyzed in Lebanon, diet costs in rural vs. urban settings will be compared**,** the relationship between diet cost and CVD risk factors will be analyzed and finally the minimal price of a healthy diet in rural vs. urban settings, using different definitions of dietary quality will be estimated for Lebanon.
Food consumption data (FFQ and 24-hr recall), personal data, indicators of socio-economic level (education, occupation, family and household information) as well as anthropometric measurements and blood tests (cholesterol, triglycerides and glucose) were collected on a sample of 800 individuals in rural areas and 180 individuals in urban areas. Data entry was completed for the rural and urban samples except for the 24-hr recalls for the urban sample. Data cleaning still needs to be done for the urban sample as well as food prices collection. The food composition table compilation is an important step for the detailed analysis of food consumption patterns of rural vs. urban population in Lebanon. Statistical analysis, model building, scores calculation, results reporting and publications are the second part of this project that represent a big part of the work that still needs to be done and is expected to be incorporated in a potential phase II of this project.

Output 9: Regional Biodiversity Workshop (Appendix 20)

In order to strengthen communication and share information with scientists in the region a regional workshop was held in February 2006 in collaboration with partners in Jordan and Kenya as mentioned above in Activity 4. The workshop included scientific sessions linking researchers in the region, a session on indigenous knowledge and another on policy involving policy makers. The discussion on Lebanese biodiversity policy during the workshop helped gather a great deal of information on the topic. It was revealed that in Lebanon there is no link in legislations or policies between conserving biodiversity and health/nutrition. The Ministry of Environment that deals with biodiversity and conservation of species through protected areas and natural reserves does not promote the collection, promotion and utilization of WEP for the enhancement of health. Moreover, the Ministry of Agriculture's policies mostly deal with the uncontrolled use of pesticides and subsidies for sugar beets. As for the Ministry of Economy, its policy is centered on subsidies for bread (implying that bread is the only food for the poor to eat), although it should focus on subsidizing dietary diversity such as in the case of promotion of WEP. In the discussions it was suggested that the Ministry of Economy should come up with market strategies for the promotion of WEP. Other relevant ministries such as the Ministry of Health should be involved in finding link between WEP and health/nutrition.

Nevertheless, policies should study the impacts of promotion of WEP on regular farmers as not to compete with them.

Output 10: Food Safety Training and Manual (Appendix 21)**:**

As stated above in Activity 1, GMP and GHP trainings were extensive and resulted in a food safety manual. This manual was written in Arabic by Mrs Basma Hemadeh and Ms. Wilma Zaccour on good manufacturing practices, food safety and personal hygiene. The manual is a necessity for every production kitchen and thus the target for this manual were the women participating in the Healthy Kitchen in the communities to whom it was distributed. This manual contains details concerning risks and controls of the external environment of the food production facility, the food production facility, food processing, and personal hygiene

Output 11: Setup of 4 pilot plants.

In order to create opportunities for production and consumption of wild edible plants and traditional foods and as a way to improve the livelihood of stakeholders, support was given for the launching of kitchens in the three selected rural communities and a fourth urban kitchen in Bourj el Barajneh Palestinian refugee camp. The number of people working in each kitchen varied across communities. The Batloun Healthy kitchen had 25 women working in it, Aarsal and Bourj el Barajneh had 12 workers each and the kitchen in Kuakh involved only 5. These kitchens serve as niche for the marketing of rural produce as well as a source of income for the communities. The kitchens function under the name "Healthy Kitchen". The Healthy Kitchen is a catering unit that provides local food choices prepared with nutritious whole ingredients. At the community level; this project increased women's empowerment and developed their nutritional knowledge regarding healthy food preparation methods. Training presentations on food safety and hygiene were also given to the teams working within the kitchens. Financially, the project resulted in some profit as the kitchen catered for various occasions such as workshops at AUB and social occasions in the communities. The number of events in which the Healthy Kitchen was involved is around 40. However, each outlet of the Healthy Kitchen performed its separate events as follows: Batloun had 7 catering events, Aarsal had 8,

Bourj el Barajneh performed 22 activities and Kuakh had only 3. Acceptance of this endeavor was high in the communities. In Batloun, the Kitchen was housed in the Batloun Cultural Club and in Aarsal at the Rural Provision Coop. In Kuakh, the women are renting a kitchen for 50,000L.L per month until the municipality finishes building their new center where they promised to provide a room for the Healthy Kitchen. The kitchen facility was supported by the project, donating electrical supplies and utensils, and in some cases renovating the whole kitchen. The impact of the "Healthy Kitchen" project on the target communities and the latter's future plans were revealed in individual interviews conducted with the project's contacts in the areas of Batloun and Aarsal. (Appendix 22)
In an interview conducted to evaluate the project's impact and reveal the community's future plans, Mrs. Ikbal Bou Saleh from Batloun's Healthy Kitchen said that the community's perception of the project was positive and everyone accepted the project's idea. When asked about the expectations for the Healthy Kitchen, Mrs. Ikbal said that the kitchen team expects the enhancement of their community's health status through healthy food preparation methods they were trained to follow. As for the benefits and experience gained from the project, Mrs. Ikbal asserted that women have acquired "meticulousness and seriousness" at work, in addition to knowledge on food safety and hygiene. She also mentioned the need for this project in Batloun (evidenced by the employment of twenty five women.) Other benefits of the project include women's empowerment and increased morale, kitchen renovation and supplies, and economic profits from catering events (for example LL 200,000 from catering a village wedding). Finally, future plans for the kitchen in Batloun would focus on supplying shops with healthy food products, in addition to continuing catering for various occasions. Their ultimate goal is to broaden the project in order to involve more villagers and hence increase cooperation and team spirit within Batloun.

The same interview was conducted with Mrs. Halimeh Hojeiry from Aarsal's healthy kitchen. According to her, the community does believe that the kitchen is beneficial, yet limitations arise due to the long distance of the village from Beirut. Mrs. Halimeh asserted that the kitchen's team, comprised of 12 women, expects to receive work and orders regularly. Regarding the project's benefits, and similar to Batloun's team, women working in the Aarsal kitchen now have better knowledge on food safety, hygiene, professional experience from every activity and have gained more power and maturity due to the challenges of the job. Financially, the kitchen gained profits through catering for several events. Finally, when asked about the kitchen's future plans, Mrs. Halimeh stated that they would like to widen the array of customers by buying a refrigerated van, hence distribute their products to different shops. The team would also be working on increasing the production of highly demanded products like dried thyme and honey. Moreover, the kitchen will be employing more women to expand the existing team and boost work efficiency.

As a recommendation for phase two of the project, we would like to improve the food safety practices of the Healthy Kitchens during deliveries by providing each facility with a refrigerated van for transportation.

Change in orientation in equipping kitchens

Initially the $10,000 budget line for equipping the kitchens was going to be used for Batloun and Kuakh kitchens, but since a partnership with the René Mouawad Foundation (RMF), the Ministry of Agriculture (MOA), the Association d'Aide au Développement Rural (ADR) and the International Fund for Agriculture Development (IFAD) was initiated for equipping the kitchen in Kuakh, an urban kitchen in Bourj el Barajneh was selected and received financial support for kitchen equipment from WEP-DD as a first step towards promotion of wild edible plants in urban communities. However, the Ministry of Agriculture audited and stopped the fund for the Kuakh kitchen. To support Kuakh, money from the project was allocated for this kitchen to buy appliances and utensils. We saw a need in Aarsal for development especially that the Ministry of Social Affairs was going to equip the local kitchen which was deemed unsuitable for use but the Ministry did not give Aarsal the stated grant for renovation. Thus, money was reallocated to the equipment budget line for the full renovation and furnishing of the preexisting kitchen.

Output 12: Report on community based technologies to improve micronutrient intake

A tutorial project entitled "Chickpea Food to Food Fortified Arabic Tannour Bread" (Appendix 23) was presented in June of 2006. This report discusses the role that Arabic bread plays in the Middle-Eastern diet. Then, it refers to Tannour bread, a kind of flat bread that is heavily relied on in rural areas in Lebanon, being developed to increase its micronutrient content. The developed Tannour varies from the Tannour bread by replacing some of the white wheat flour with chickpea flour in order to benefit from the nutrients in the latter and incorporate them into the Middle-Eastern diet. The two kinds of bread, Tannour and chickpea-fortified, were compared using 5 experiments in order to identify the strengths of the chickpea-fortified bread. These two kinds of bread were subjected to moisture determination using the oven drying method, ash determination using the dry ashing method, fat determination using the Goldfisch method, protein determination using the Kjeldahl method, and metal determination for Iron. When these breads were compared, results show a higher mineral content especially iron in the fortified bread. Accordingly, food-to-food fortified bread was promoted in the region studied (Aarsal) to support optimal health and nutrition.

C. Information sharing and dissemination outputs:

Output 13: Report on the health status of the populations in the region "A Review of Health Status in Lebanon" (Appendix 24)

This report is a review of the health status in Lebanon with focus on nutrition related diseases and problems. Patterns of food consumption across time and areas were examined. This report serves as a summary of several studies performed in Lebanon. First, a look on consumption patterns is revealed to set the ground for the discussion. Nutrition related health issues are then detailed in the following categories: non-communicable diseases, overweight and obesity, physical activity, stunting and wasting, iron deficiency anemia, bone health, breastfeeding practices. In addition, a section on miscellaneous health problems describes rates of cancer, smoking, and lead poisoning in Lebanon. All the articles cited in this report show the need to engage in preventive measures such as incorporating healthy eating habits to combat emerging health problems.

Output 14: Report on marketing analysis of wild edible plants and foods processed out of them (Appendix 25)

A report on marketing strategy for the Healthy Kitchen network comprises a SWOT analysis and a marketing plan. The SWOT analysis looks in depth at the strengths, weaknesses, opportunities and threats that the Healthy Kitchen has. The marketing plan incorporates pricing, advertising and promotion, public relations, sales channels, and distribution and deliveries strategies. The plan devised for these kitchens has not been put to action and is recommended to be completed in the second phase of the project.

Output 15: Report on current agricultural policies in Lebanon (Appendix 26)
The report "Agricultural and food trade policy in Lebanon: Overview and economic analysis" aims to better understand the role that agricultural and food trade policy may have played in creating the somewhat extinguished agricultural sector, and point to options for improving it. Apart from agricultural calendars and periodic and specific high tariffs, Lebanon is taking part in the global movement toward freer trade. Many trade restrictions, including those on agricultural and processed foods, are gradually disappearing and bilateral and multilateral agreements are being ratified. Adhesion to free trade agreements has put pressure on Lebanon to decrease tariffs and subsidies, limiting possibilities to counteract the effects of its overvalued currency. Lebanon's agricultural trade balance is also increasingly deteriorating as free trade increases without substantial support for improved production. Short case studies of wheat and sugar, the two subsidized food crops, conclude that there are societal costs to the price support programs, and yet they are not part of an overall strategy for agricultural development nor do they have a particular economic, social or environmental justification for existing. The Ministry of Agriculture's 2004 Agricultural Development Strategy is an important step in the restructuring, focusing and prioritizing of agricultural policy in Lebanon, which would allow the rationale and decisions to be made for a sector which has

enormous potential because of its geographic and climatic position but has been underutilized and undermined.

Output 16: Policy brief (Appendix 27)

The issue of dietary diversity and its association with a better health is becoming very common. Protection of biodiversity and natural resources and development in poor areas are two additional challenges that face Lebanon. The use of Wild Edible Plants could be a key for this multifaceted problem. Policies that protect biodiversity in Lebanon are deficient and when available not implemented. There are no policies that target the promotion of a sustainable use of Wild Edible Plants in poor areas to expand economic opportunities. Many ministries share the responsibility, but none is attending to it. Lack of policy initiation and implementation as well as lack of cooperation characterize the chaotic situation. A comprehensive policy focused on Wild Edible Plants is needed. This could only be achieved by acknowledging Wild Edible Plants as a national priority and a key for a multifaceted problem. A central body made of representatives of the various stakeholders is to be formed and held responsible for conducting research, assessing needs, interacting with communities, and initiating policies that are to be implemented by the empowered ministries. Such a central body built over the concepts of pragmatism and cooperation, and accompanied by a higher authority interest, care, and will, will be able to successfully make a change in the health, economy, and environment in Lebanon.

Output 17: Report on wild edible plants in the target communities (Appendix 28)

The report entitled "Surveying and Monitoring Wild Edible Plants" assesses the status of wild edible plants and the impact of collection on their distribution and sustainability. The following questions were answered: What *species occur in what habitat?* , *How many are collected?* , *How unique are the habitats? , When are species collected?* , *What parts are used?* , *How does collection affect regeneration?*
Field surveys were divided into quantitative (wild habitat species distribution) and qualitative (collection practices related to wild edible plants). Recorded eco-geographic information included species density, frequency of occurrence, and coverage in each quadrat. It was found that people collect heavily and population density is low and patchy. However, there was evidence of new shoot emergence following harvesting while only few plants 'escaped' collection and were able to reach flowering and seed set. Species are not widely distributed and some species are restricted to water bodies. Most species are present at a very low density ranging approximately between 40 and 1200 plants per dunum (1000 m^2). The higher ranges do not indicate dense coverage because they were related to small sized plants. Species are present as long as water is available, and then shed their seeds when water courses dry out
Specifically, there is high economic revenue from Akkub leading to aggressive harvesting with no attempt to domesticate this plant. Fennel harvesting occurred in nearby areas because species grows on the roadsides. There was no observed trade of fennel, its collection was limited to home use. For Mallow, harvesting occurs in proximity of irrigated orchards with no attempt to domesticate the plant maybe because it

is abundant in the wild. Dardar is collected from rangelands and is present in very large quantities in cultivated lands and close to water springs

Output 18: Two Bilingual cookbooks (sent separately)

One of the steps towards promoting consumption of wild edible plants includes the production of promotional documents such as cookbooks that include traditional recipes. During the months of April and May of 2005, a series of cooking festivals were launched in the villages of Aarsal, Kfar Nabrakh, Kuakh in addition to an urban community: Bourj el Barajneh Palestinian refugee camp where women from the community were invited to present dishes based on wild edible plants. Recipes were collected for the purpose of including them in the cookbook and information on different community based technologies was gathered. These recipes were standardized for *The Healthy Kitchen: Recipes from Rural Lebanon*, a bilingual (Arabic –English) cookbook of traditional recipes that include wild edible plants. This cookbook also consists of a brief description about the wild edible plants used with the available Arabic, English and scientific names as well as their known therapeutic and active compounds. A nutrient analysis table was included for the wild edible plants mentioned in the recipes. Another cookbook published was *Our Mountains Savours*, a bilingual (English – French) cookbook of traditional Lebanese recipes produced under the Food Heritage Foundation. This book includes a brief history of each recipe and a very interesting section that contains stories and anecdotes of some popular foods

Change in orientation
Two cookbooks were published instead of one.

Output 19: Report on the sub-Saharan African experience through direct testimony.

- Initial contacts with Timothy Johns of IPGRI have been established.
- Visit of PI to Kenya in the fall of 2005, participation in African regional workshop on African leafy vegetables and lecture on this project was presented. Contacts were made with different organizations and individuals such as Kyanika Adult Women's Group, IDRC director François, professor Ruth Oniang'o a nutritionist and Kenyan Member of Parliament, Francis, IPGRI field worker and the Senegalese delegation

- Visit of Patrick Maundu from Kenya to Beirut for participation in regional workshop and he gave a lecture on the Sub-Saharan experience in promoting African Leafy vegetables

Change in orientation

- Visit of PI to Senegal was cancelled due to time constraints.
- The report is still in progress

Output 20: Setup of a scientific network and linkage with local governments and Non-Governmental Organizations (NGOs).

In order to reinforce efforts being made towards promotion of wild edible plants and the consumption of a more diversified diet, work was carried out towards the setup of a scientific network including government officials and NGOs as follows:

- During the months of March, April and early May of 2005, the project was launched through a series of meetings with community officials such as the Director of the Ministry of Social Affairs' Health and Social Center in the town of Hermel and the Aarsal Rural Cooperative and Municipality directors.

- Local Links Healthy Kitchen Partnership: Twelve youths from Kuakh and Bourj el Barajneh Palestinian refugee camp were trained through the Local Links initiative "Healthy Kitchen". The partnership with Local Links and OXFAM-Québec, and the Canadian fund for social development, aimed at allowing better valorization of traditional food in the concerned communities by focusing on young people and facilitating trans-generational traditional knowledge exchange. Several events were organized through Healthy Kitchen to disseminate the health benefits of WEP consumption in the communities with the means of pamphlets and menus. The organized activities included a fundraising and 6 catering events carried out for different organizations such as the American University of Beirut, UNESCO and the Ministry of the Environment.

- Partnership with RWIGAT: The René Mouawad Foundation (RMF), the Ministry of Agriculture (MOA), the Association d'Aide au Développement Rural (ADR) and the International Fund for Agriculture Development (IFAD) have a common program named Rural Women's Income Generating Activities and Training Program (RWIGAT). Partnership with this program was supposed to be providing the kitchen of Kuakh with equipment for the value of US$ 7,500. RWIGAT provided training for women and youth participants in accounting and food processing.

- Partnership with the United Nations Development Program (UNDP) was established for the organization of an event entitled "Bi'atouna Baytouna"

("Our environment is our home"). They provided training in catering services.

- Contacts were established with Stefano Padulosi of IPGRI, Dawood Al-Eisawi of University of Amman, Irmgard Hoeschle-Zeledon of Global Facilitation Unit (GFU) for underutilized species and Tim Johns of IPGRI for regional and international collaboration.

- Paul Bordoni from GFU presented at the Regional Biodivrsity workshop. Contacts were then initiated in Rome with GFU, FAO, etc.

- A connection with two universities in Canada; McGill University and Université Laval , and in France, Université de la Méditerranée Faculté de Médecine de la Timone – Marseille was established through supervision of thesis work based on WEP-DD.

Output 21: Website for the "Wild Edible Plants: Promoting Dietary Diversity in Poor Communities of Lebanon"

The website was set up and can be accessed at www.wildedibleplants.org . It is in English but we would like to provide our web users with an Arabic version during phase two. This will need professional translation.

Output 22: Poster presentation (Canada, 2006)

The Economics of Dietary Diversity: diet, food security and agro-biodiversity in rural Lebanon by Hunter E, Batal M, and Debailleul G (Appendix 29)

Output 23: Poster presentation (Spain, 2006)

Use, consumption and Health and Medicinal Properties of Six Wild Edible Plants in the Northeast of Lebanon by Jeambey Z, Johns T, Talhouk S, and Batal M (Appendix 30)

Output 24: Community Awareness Campaign (Appendix 31)

The campaign targeted the communities of Hermel, Chouf, Kuakh and Aarsal. The aim of this presentation was to share the major findings of phase I of the project to the target areas in order to raise their awareness about their current health problems and increase the communities' knowledge around the importance of diet diversity and the benefits of wild edible plant usage in resolving their health complications. Another important objective of this presentation was to deliver easy and practical healthy eating and dietary diversifications solutions in order to make and sustain a positive change in the communities' dietary habits. The campaign mainly consisted of a one hour interactive power point presentation. This was followed by a discussion session to give the communities a chance to fully grasp the presented material and proposed solutions for better sustainability. In the Chouf area, 7 presentations and lectures were given with an

average attendance of 30 people throughout the month of April as part of extensive work based on thesis work by Ms. Rasha El Jundi. In Aarsal, the presentation took place on the 29th of April, 2007 and 30 people attended. Thereafter, on the 4th of May, 2007, the people of the Kuakh and Hermel communities attended this session with 120 present from various NGOs working in the communities, political leaders, and the villagers.

Output 25: Article**:** *Traditional Lebanese recipes based on wild plants: An answer to diet simplification?* (Appendix 32)

This invited article written by Dr Malek Batal and Elizabeth Hunter is to be published in the Food and Nutrition Bulletin in the June 2007 supplement issue.

Output 26: Presentation: The potential of biodiversity –based traditional Lebanese recipes in improving dietary diversity and food security.

This paper written by Dr Malek Batal and Cynthia Farhat was presented at the Biodiversity and Health Conference (COHAB 2005), Galway, Ireland

VIII. Capacity-building

a. Institutional reinforcement and sustainability of the research organization

New equipment was purchased in order to collect body measures such as body fat monitors, blood pressure machines, weight scales, and measuring tapes, cups and spoons and many other office stationary. The equipment could be used for later research in the Department of Nutrition and Food Science.

b. Research or administrative skills of the researchers involved

The research and administrative skills of the research team both increased. Much research was done on how to write a questionnaire, a consent form, how to obtain

approval by the Institutional Review Board (IRB), how to train interviewers, etc. Over 20 research assistants gained invaluable experience by working on this project from researching, data collection, data entry and data management. Members of the research team attended international conferences and workshops that were essential to the project development. As stated before, WEP-DD is a multidisciplinary project creating learning opportunities particularly allowing growth in other disciplines (nutrition/agriculture/resource management/small business development/marketing…).

Because of the project's three different entities; Department of Nutrition and Food Science, Initiative for Biodiversity in Arid Regions (IBSAR) and the Environment and Sustainable Development Unit (ESDU), at the American University of Beirut collaborated together on daily basis to meet all the requirements of this project. Administrative skills as well as interdepartmental communication were also increased due to the following up on different project matters. Most importantly, communication with community members enriched team member's knowledge and attitude towards the importance of improving livelihood, health, and nutrition.

c. Contribution to capacity-building of women

Project team members include a good number of women. The investigators are 2 women and 3 men. As for the rest of the team, of the 33 research assistants and consultants hired 26 were females. In addition, of the14 interviewers conducting the data collection only 3 of them were males. Most community members with whom communication was taking place were women.

During the first part or the project and in an effort to launch kitchens in the communities, training on Food Production and Hygiene was organized for women from the different communities. The 20 women and youth who attended the workshop were all given training on how to apply Good Manufacturing Practices (GMPs) and Good Hygienic Practices (GHPs). The training also included hands on cooking of traditional recipes under the guidance of project team members. Other than the information gained, financial benefit for the women of these communities came in the form of payments for the key informants and catering events of the Healthy Kitchens.

IX. Project management

Being a project operating under IBSAR and ESDU, both being organizations supported by AUB, lengthy and complicated administrative procedures often delayed the implementation of several outputs. The main problems were due to a change in administrative procedures such as rules concerning casual labor and petty cash at AUB. This happening simultaneously with a staff turnover within IBSAR and ESDU further increased impediments along the course of the project. Stricter employment regulation by AUB makes hiring local coordinators on a part-time basis a difficult task. Employment regulations at AUB did not allow for an increase in remuneration for skilled full time personnel causing a high staff turnover during the life of this project. There were three different project coordinators during this period which affected the continuity of the work. Moreover, many students worked as volunteers or trainees for a couple of months. Most of the team members worked on a part-time basis which sometimes made it difficult to have a one informed team. Qualified candidates for the job looked for a more permanent position in their field.

As for the support by IDRC, there was a close contact with the senior program officer in Cairo who was available to provide feedback at all times. In general, there was a continuous support and supervision by IDRC throughout the whole process.

X. Impact

The impact of this project was embodied in various occasions. In the village of Kuakh, the Municipality promised to house the Healthy Kitchen in the new building which is still under construction. This shows enormous faith in the project and its principles. As a sign of support for and adoption of the project, the Batloun Cultural Club presented Dr. Malek Batal with an honorary shield as a token of appreciation of the project. The women in Batloun Healthy Kitchen were involved for the first time in economic decision making as a result of the catering business. Moreover, our key informant in Kuakh, Mrs. Khadijeh Chahine, was contacted by Green Line, a non governmental association embracing the principle of environmentally sound development in the developing world, after seeing her give a presentation in the Regional Biodiversity workshop that took place in February 2006. She was asked by them to attend a 7 day conference in Mali for discussions of problems encountering farmers and fishermen in 172 countries and ways of encouraging their production.

The project equipped 4 kitchens in different Lebanese communities (Batloun, Kuakh, Aarsal, Burj el Barajeni), a group of women are in charge of each kitchen thus empowering women economically. Improving their knowledge of overall nutrition (including hygiene and healthy cooking) would greatly contribute to a heightened nutrition awareness of the community as a whole. WEP-DD's impact on the health status of these communities is also expected due to several awareness activities conducted.

XI. Overall assessment

Tremendous effort was put on WEP-DD to produce the research and development efforts outlined here. This project was very limited in terms of time, exacerbated by the seasonal nature of wild edible plants and also by the instability of the country. At the

beginning of the project, the assassination of Lebanon's former Prime Minister Rafic Harriri and the events that followed (protests and bombings) hindered work at every step. Then in the following year, the summer war halted work for a period of two months and many planned activities were cancelled. This emphasizes the need for more time for the phase two of the project.

XII. Recommendations

During this phase of the project, a number of activities targeting poor communities in Lebanon have been successfully implemented. Four kitchens have been established in Batloun, Kuakh, Aarsal, Burj el Barajneh; regions that have been characterized with depressed economies. Kitchens created new employment opportunities and supported the economy in the community in addition to promoting use of wild edible plants. On the other hand, a number of promotional activities have been implemented on the national and community levels including the broadcasting of a number of episodes in a renowned national television show promoting knowledge about traditional foods and wild edible plants. Focus group meetings were done in the selected areas to collect information about indigenous knowledge regarding the use, harvest, and benefit of more than 46 wild edible plants. Recipes were collected, standardized and analyzed for their nutritional values. Moreover, an electronic database was created documenting information about wild plants.

In addition to work being done in order to promote the use of wild plants and thus improve dietary habits, extensive work has been done in order to assess the potential benefit of wild plants and traditional foods in general. A thousand individuals from the selected areas were surveyed and asked a series of questions through a 1-hr interview. Data collected from this survey included information about health, lifestyle habits, economic status, dietary habits, and food security. Analysis of the data will be used in order to document the nutritional and health status of poor communities relying on wild edible plants. The data will also be used to compare food habits between urban and rural areas thus the need for a follow up study.

Following the same objectives worked on, a set of activities are suggested and planned to be implemented in the future. The WEP-DD allowed a thorough investigation of the linkages between the ecosystem, the diet, and health and pointed to a number of problematic areas in the health of the environment as well as that of the community and the individuals. We propose to address, and redress, these problems through a phase II of the project with some strategic shifts towards the priority areas.

Chronic disease is the scourge of Lebanon. Our findings help emphasize the great toll chronic disease, and particularly cardiovascular disease (CVD), is taking in this community. The extremely high rates of cardiovascular disease risk factors urge immediate action and better understanding of what hinders the adoption of healthy lifestyles to combat disease. Has the ecosystem lost its ability to provide a healthy diet and the opportunity for an active lifestyle? How can the promotion of the traditional food system, with the Mediterranean diet's great potential, translate into improved food

choices at the household and individual levels? What are the elements in the Eastern Mediterranean diet with the greatest potential in protecting from CVD? What wild plants can be promoted without the risk of resource depletion? What ecosystemic measures can be taken to develop in a sustainable manner the wild edible plants available for consumption? Who are the stakeholders and policy makers likely to make a difference in nutrition and health? If the diet in the community doesn't seem to be blatantly wanting in any food category what foods that are eaten in excess could be explaining these high rates of chronic disease risk factors? Are there any other risk factors related to occupation, physical activity level, and cultural norms? What role do community members see themselves playing in the search for answers to problems of negative health outcomes?

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Appendices:

Appendix A: Additional Results

Appendix 1: Aarsal Demographic Profile

Appendix 2: Hermel Demographic Profile

Appendix 3: Kuakh Demographic Profile

Appendix 4: Batloun Demographic Profile

Appendix 5: Kfar Nabrakh Demographic Profile

Appendix 6: Warhaniyeh Demographic Profile

Appendix 7: Questionnaire Arabic Version

Appendix 8: Questionnaire English Version

Appendix 9: Annahar Article

Appendix 10: Daily Star Article

Appendix 11: Afkar Article

Appendix 12: Maingate Article

Appendix 13: Wild Edible Plants Database

Appendix 14: Analysis of Indigenous Nutritional Knowledge, Cultural Importance, and Nutritional Content of Wild Edible Plants by Cynthia Farhat, Ms Thesis

Appendix 15: Use, Consumption and Health and Medicinal Properties of Six Species of Wild Edible Plants in the Northeast of Lebanon by Zeinab Jeambey, Ms Project report

Appendix 16: Assessing the Current Use and Significance of Wild Edible Plants Traditionally Gathered in Lebanon: An Ethnobotanical Study by Maysan Marouf, Ms Thesis

Appendix 17: Effect of Non-Nutrient Carotenoids on the Incidence of Age-Related Cataracts in Poor Areas in Lebanon by Joelle Zeitouny, Ms Thesis proposal

Appendix 18: Development, Implementation and Evaluation of a Nutrition Education Tool to Target Chronic Disease Risk Factors in a Lebanese Rural Community by Rasha El Jundi, Ms Thesis proposal

Appendix 19: What Is A Healthy Diet In Lebanon And How Much Does It Cost? A Rural vs. Urban Comparison by Carine Issa, PHD Thesis proposal

Appendix 20: Regional Biodiversity Workshop

Appendix 21: Food Safety Manual

Appendix 22: Healthy Kitchen Report and Interviews

Appendix 23: Chickpea Food To Food Fortified Arabic Tannour Bread by Yara Qutteina, Alham Zaidane and Lina Harb

Appendix 24: A Review of Health Status in Lebanon by Darine Barakat and Khouloud Maatouk

Appendix 25: Marketing Analysis Report by Mirna Sharara

Appendix 26: Agricultural and Food Trade Policy in Lebanon

Appendix 27: Policy Brief

Appendix 28: Surveying and Monitoring Of Wild Edible Plants

Appendix 29: Poster Presentation (2005, Canada) the Economics of Dietary Diversity: Diet, Food Security and Agro-Biodiversity in Rural Lebanon by Hunter E, Batal M, and Debailleul G

Appendix 30: Poster Presentation (Spain, 2006). Use, Consumption And Health And Medicinal Properties Of Six Wild Edible Plants In The Northeast Of Lebanon By Jeambey Z, Johns T, Talhouk S, And Batal M

Appendix 31: Community Awareness Campaign Presentations

Appendix 32: Draft article by Dr Batal: Traditional Lebanese recipes based on wild plants: An answer to diet simplification?