

Review Report

Health and Dietary Diversity in Yemen

Traditional Yemeni Rural Diets and Local Food Systems: Enhancing Contributions to Health and the Environment



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1. Terms of Reference

In July, 2008, IDRC requested the services of this consultant (Appendix I contains his CV) to provide an objective assessment and constructive feedback on the project “Health and Dietary Diversity in Yemen” with a view to identifying the lessons learnt and any remaining salient gaps. In particular, the consultant was requested to:

- a) Synthesize and document project results, outcomes and outputs in relation to the project’s overall and specific objectives with a focus on the knowledge produced, the capacity built and identify any policy outcomes resulting or influenced by the project.
- b) Identify strengths and weaknesses of the project team, including administrative/management in relation to project objectives and performance.
- c) Identify any salient knowledge gaps, and possible research questions and approaches that might be used in a possible phase II.

2. Executive Summary

To evaluate the project Health and Dietary Diversity (HDD) in Yemen: *Traditional Yemeni Rural Diets and Local Food Systems: Enhancing Contributions to Health and the Environment*, as per the TORs developed for this review, the consultant reviewed all the documents resulting from the project, held in-depth interviews and discussions with the IDRC program officer responsible for the project and conducted a trip to Yemen to meet and discuss with the project team and the projects' boundary partners, visit the project sites and finally attend the end of project workshop. This all occurred in early July 2008. This report addresses the findings of this project evaluation.

All in all, given the time and the budget provided to this project, the project has been a success and has met – in varying degrees-- its four specific objectives: diverse important knowledge has been produced, policy has been informed with the research results, capacity has been built and the project has provided important networking opportunities with the outside world most notably with teams like the one in Lebanon with the American University of Beirut working on a similar research topic and other nutrition, health and environment specialists.

This is not to say that the evaluation did not pick up on any issues, the most fundamental of which are 1) The over-ambitiousness of the project given the time and budget allocated to it, 2) evident frictions among some members of the research team, 3) weak ability to synthesize data in a multidisciplinary and integrated way, and 4) poor ability to report findings, achievements and challenges in English.

In terms of recommendations for possible future phases, this review recommends a second phase for the project provided that administrative difficulties are overcome. This review proposes that, should a second phase be developed, these administrative issues, along with important capacity development opportunities be resolved and improved upon. One option could entail encouraging partnerships between the Sana'a University and Canadian institutions, as well as other possible institutions in Yemen.

As Yemen is an Arabic-speaking country and academics have little mastery of English or French, this review proposes that project documents and reports be provided to IDRC's regional office in Cairo in the Arabic language. This would provide a more accurate account of the work provided by the different co-investigators and would allow all those who contributed to the project to gain ownership of the project outputs and participate in synthesizing its final reports.

3. Project Background

The HDD project was initiated in 2006 with the Yemeni Genetic Resource Centre (YGRC) of the Faculty of Agriculture at the University of Sana'a. The project was funded for 210,300 CAD for 24 months (and then provided with a 6 month no cost extension followed by another three months no-cost extensions) as an IDRC Ecohealth project to improve the health of rural communities in Yemen, the poorest country in the MENA region. The aim of the project was to improve the resilience of very poor and isolated communities in the highlands to achieve better health and nutrition outcomes. In hindsight, the necessity of such an endeavour became all the more apparent with the sharp increase in the global price of food and the impact this was having in developing countries highly dependant on food imports, including Yemen. Although *food security* was not spelled out as a concept in the project objectives, it became clear to all project stakeholders (IDRC, research team and the policy makers) that the project could offer a unique opportunity to contribute something to this issue in light of the emerging global challenge.

Below are the project objectives:

Overall objective

To improve the health of poor rural and urban communities and enhance sustainable natural resources management by promoting traditional rural diets and local food production systems.

Specific objectives

1-An in-depth understanding of the linkages between indigenous knowledge (IK), traditional food production systems and natural resources (NR) management, which contribute to mitigated health risks and sustained agro-ecosystems in highland communities.

2-Identify, test and promote possible interventions and best options that contribute to local economic development, sustainable NR, health and well-being, through continuous activities mainly due to the 2nd year of the project (some GR testing start during the 1st year). Emphasis will be placed on promoting and enhancing traditional rural diets and local food production systems.

3-Promote knowledge exchange and networking through cross-project learning and participation in the regional community of practice (COPEH-MENA).

4-Build the capacity of young researchers on health and environmental linkages.

I. Project Results, Outcomes and Outputs:

It is the belief of the current review that most specific objectives have been at least partially met with the exception of specific objective number 2.

The project outcomes can be synthesized as follows

- A good ecosystem mapping of the participating communities in terms of demographics, geographic location, altitude and relief, soil, water ecosystem, level of chemical and organic contamination in the environment, disease and nutrient deficiency prevalence, etc. The linking of this information with specific research questions has tremendous potential.
- An impressive account of the traditional foods typically consumed in the 3 participating communities and traditional utensils used to prepare them. This information is essential for an accurate interpretation of food consumption data and for the exploration of the role of traditional food in improving diet quality and ultimately food security at the community level.
- An account of ancestral water conservation techniques and rainfed agriculture. Traditional wisdom is eroding very quickly and its conservation and proper re-dissemination is critical.
- A great deal of visibility for the local foods and the traditional agricultural methods used to produce them. In a context where food for special occasions is often imported and of lesser nutritional quality, this exposure can lay the grounds for a systematic program of local food promotion at the local and national levels.
- Good capacity building activities for several team members, including international meetings and site visits to other similar projects in the region.
- Interest among policy makers, notably at the level of the Ministry of Agriculture. This hard won interest should be followed up with concrete measures such as policy briefs to capitalize on the emerging interest in food security issues among Yemeni policy makers.
- As mentioned earlier, the project outputs (listed in Appendix III from the final report) were many and often exceed the expectations outlined in the original proposal. However,
 - It is difficult to assess the quality of the data collected, particularly the questionnaire based survey data and the clinical and laboratory results. The researchers did not report the measures taken to assure quality (protocols used to train interviewers and to check data collection accuracy in the field and back in Sana'a for example). In most presentations and reports, little attention was given to the methodology description.
 - A great deal of valuable qualitative data has been collected. The methodology of data collection is often not well described (group meetings with locals, interviews with individuals, etc.)
 - The nutrition and economics sections of the survey are bogged down by too much detail and little analysis. This degree of detail may have introduced bias which would be hard to account for in the statistical

analysis. Greater attention is needed in any second phase (if supported) to streamline the questions and focus on the essentials. The data is hard to interpret and needs more synthesis (for example: indices for local food consumption vs. reporting individual food items).

- Because of the wide age group selected and the convenience nature of the sample, interpretation of the data for research purposes is difficult.
- There is a great potential for more development work embedded in the project (ie interventions). This potential has not yet been fulfilled. Communities have been left with little other than some almond saplings. Strategies for improving nutrition and health need to be implemented such as developing health and nutrition education campaigns based on the project findings. Moreover, income generating activities related to the traditional lifestyle, including the selling of traditional foods, could be initiated as part of ecotourism projects.
- There is also great potential for capacity building at the local level. Several people (including key women) and some organizations have been identified in the communities. These individuals and organizations need to be supported and recruited to help perform the development work mentioned above. Proper training in health and nutrition education for example would help bring about lasting positive change in the communities.
- Capacity building activities could have been better distributed among the research team members. Support in methodology development for all team members is essential for a successful phase II if supported.
- Beside the end of project workshop, policy work has been less than optimal. Policy makers need to be systematically targeted with policy briefs and possibly a policy workshop.

II. The project team

The project team consisted of about 7 people from different disciplines including Dr. Amin Hakimi, the project leader, who is a genetic resources specialist and plant breeder, Dr. Adnan Al Qubati, a food scientist, Dr. Sadeq Sharaf, physician; Dr. Mokhtar Dael Othman, soil and water specialist, Dr. Ahmed Samawi, a socio-economist and Statistics Specialist, Frédéric Pelat, a sociologist and Ms. Anhar Abdulkarim, a plant breeding student. All in all, the research team, in the view of this consultant consisted of the appropriate mix of disciplines needed for this project. However, it is also noted that there was a significant turnover of staff (at least three key staff members left the project during its implementation). It is also noted that only one woman was a member of this team. While this seems very unbalanced, the fact that there was any woman at all on the team is a great success in the Yemeni context where gender inequity is prevalent. This student proved herself as a key member of the team and conducted many important functions including community based work. More information about the team is provided in the table below.

	Name	Institutions	Contacts
1	Dr. Mohammed Hamid Yassine al Aswadi	Yemeni Genetic Resource Centre, YGRC, Sana'a University	0 967) 777 650 015 aswadihm@yahoo.com
2	Dr. Amin Al Hakimi Team leader	The Yemeni Association for Sustainable Agriculture Development (YASAD Chairman since March 2007)	(00 967) 711 658 330 aminalhakimi@yahoo.com
3	Dr. Adnan Al Qubati	Department of Food Science, Faculty of Agriculture, Sana'a University	(00 967) 734 064 844 adnanMR21@yahoo.com
4	Dr. Sadeq Sharaf Saed	General Physician and Dr. in Community Medicine Tuberculosis Institute & Min. of Public Health & Population	(00 967) 734 693 674 Sadeq1967@yahoo.com
5	Dr. Mokhtar Dael Othman	Department of Soil, Water and Environment, Faculty of Agriculture, Sana'a University	(00 967) 711 931 410 mokhtarothman@hotmail.com
6	Dr. Ahmed Al Samawi	Socio-economist and Statistics Specialist, Department of Agro-economy, Faculty of Agriculture, Sana'a University	(00 967) 777 009 044
7	Frédéric Pelat	IDDEALES French NGO, Yemen branch	(00 967) 733 285 193 fredericpelat@yahoo.fr
8	Anhar Abdulkarim Yaani	YGRC and YASAD Association (responsible for the women section since March 2007)	(00 967) 777 766 972 anhar_1992@yahoo.com

The consultant held several meetings with Dr. al Aswadi, who has been recently appointed director of the YGRC, replacing Dr. Hakimi. Dr. al Aswadi's involvement in the project was minimal due to the recent nature of his appointment. He nevertheless controls the project funds and appears careful in dispensing them. According to the other members of the team, this has led to some delays in the project activities. Dr. al Aswadi challenged the complaints about the speed with which the money was spent. Dr. al Aswadi took the consultant on a tour of the Centre's modest facilities. It wasn't immediately clear how the Centre's infrastructure, if at all was used in the HDD project. It should be noted that computer facilities seemed adequate however the electric supply to the entire university was intermittent, possibly delaying the work.

Dr. Amin Hakimi is the project's leader. He is a genetic resources specialist and plant breeder and was the previous YGRC director. Dr. Hakimi is passionate about the HDD project and is capable of eloquently describing the project and its outcomes. He recognizes the administrative problems that have arisen and attributes these to political issues and difficult relationships with the president of the University which resulted in his subsequent sidelining from the directorship of the YGRC. The project was chiefly his brainchild, and he therefore has strong ownership of the project. His relationship with the community members seemed extremely congenial. This is invaluable for a research and development project requiring the active involvement of community stakeholders.

Because Dr. Adnan Al Qubati is the food scientist and is the one most involved in the nutritional aspect of the project, this consultant exchanged quite extensively on methodology and analysis. Some of my reservations were expressed concerning the methodology used, particularly in the sample selection. While it is understood that the sample size was a convenient one based on the preliminary meetings in the communities (30 farmers in each community), it is hard to draw any statistically significant conclusions from such a small size. It is my impression that generalizing the results to the community itself is not so straightforward, let alone any attempt to generalize the results to the country at large. The questionnaire used was also very ambitious, asking many questions and then running out of time to make use of the data collected. This is typical of the culture and can be noted in most research project of this nature. Should a phase II be developed, it is recommended to **focus** the work on fewer pertinent questions. As Al Qubati raised the issue of food safety (there are problems of aflatoxins in the stored food products) this aspect could be tackled in a phase II of the project.

Dr. Mokhtar Dael is a soil and water specialist. He has performed important ecosystem mapping of the project sites as well as introducing aerobic composting and collecting data on the traditional water management techniques.

Dr. Sadeq Sharaf is a Romanian trained physician currently employed by the Yemeni Ministry of Health whose contribution to the project is more recent (May 2007). Dr. Sharaf replaced Dr. Adel Al Hagami who became unavailable to the team because of other duties. Dr. Sharaf explained how the team proceeded with the clinical examination and the lab analysis. The consultant believes that the sample size is still an issue for the clinical aspect of the work, especially since the age groups were not defined and participants' ages varied between 2 and 90 years. A focus on one age group with a clear definition of the relationship of the clinical work to the research question would have been beneficial and should be contemplated for a phase II. The consultant also raised the issue of ethics with Dr. Sharaf since funds were not made available to provide anti-parasitic treatment for individuals found to be affected. The consultant stresses that the provision of treatment is an ethical obligation and that the US\$1.5/person cost isn't prohibitive.

Dr. Ahmed Samawi is an economist who joined the team in February 2007, replacing Dr. Ali Qassem who became a Deputy Minister and was thus no longer available to participate in the work. The consultant believes that the project would have benefited from Dr Samawi's earlier involvement who finds himself currently in the uncomfortable position of making sense of data he had no say in the way it was collected. He believes that the questions are too many in the survey, possibly causing some confusion and inducing fatigue in the respondent.

Despite Mr. Frédéric Pelat's heavy involvement and pivotal role in the project (proposal and report writing), his role and that of his organization's (IDDÉALES) wasn't properly acknowledged during the end of project workshop or during any policy meetings.

Ms. Anhar Abdulkarim has a dual role with the project. She is both a Masters student under the supervision of Dr. Hakimi working on her plant breeding thesis project as well as being involved in the extensive ethnographic study on the traditional Yemeni recipes collected in the participating communities (particularly women) and disseminated through a cookbook. While Ms. Abdulkarim's thesis (supported by this project) is totally adequate, her ethnographic work was of incredible quality. This work is one of the major outputs of the present project.

It wasn't always clear how committed the co-investigators were to the project in its entirety. Dr. Hakimi, the principal investigator and Mr. Pelat were perceived as the clear leaders of the project but other members seemed to have a role limited to their personal contribution. If trans-disciplinarity is to be reached, all team members should feel and have ownership of the project. This additional buy-in can be achieved through increasing visibility of the individual components (as in including the reports of each section in the final report) and through a clear allocation of the project funds to the various project components. In Yemen's difficult financial situation, the per diem professors were given to go to the field were an important incentive. Per diems should definitely be maintained for such work. Based on the experience of this consultant, it is his belief that each co-investigator should be able to provide a budget for their activities and be expected to adhere by it. If a phase II is to be planned, one way to avoid the problem could be giving the budget management function to a Canadian institution.

Analysis of the end of project workshop (July 2-3, 2008).

This end of project workshop (see Appendix for agenda) was attended by about 100 people including several senior and junior Ministry officials. It was the main dissemination and policy influencing activity of the project. The workshop was also attended by farmers and their families (at least two women were present throughout). However, farmers were not given much of an opportunity to express themselves during the workshop. Though some discussions were interesting, a lot of the discussion was at a very academic level. No minutes of the workshop were taken. Besides separate presentations from the team members on each of their various pieces of work, only Dr. Hakimi and Frederic Pelat attempted to synthesize the work in a more integrated fashion.

The workshop also offered presentations by the two graduate students involved in the project and presentations by other researchers in Yemen who are doing similar work. Dr. Mohamed Ashour Al Katheeri, Dean of the Faculty of Agriculture, University of Hadramout spoke on the Yemeni food systems. His talk reflected a wide definition of food security and stressed the importance of traditional crops such as dates, raisins, as well as traditional ways of preparing the staple foods such as the food-to-food fortified bread in meeting food security goals. His was a revolutionary talk in many aspects. A second phase project—if developed would benefit tremendously from an association with him. This would be particularly true for the work carried out by Anhar Abdulkarim on traditional recipes.



Figure 1 View of the audience

The workshop also provided an opportunity for informal afternoon Qat sessions which were used as debriefing sessions and forums for the farmers to express their opinion. They also provided the opportunity for the researchers and farmers to meet and exchange views with policy makers. It was during such sessions that the consultant was able to conduct many of the individual and group meetings for the review.



Figure 2 Adnan Al Qubati



Figure 3 Anhar Abdulkarim

3. Analysis emerging from discussions with the community

In this section, the consultant presents his ideas/issues emerging from several meetings held with community members both in Sana'a at the margin of the workshop and in the communities of Rabat and Arafah during a rapid field trip on Friday, July 4th.

In general, the farmers were supportive of the project and hopeful that it was going to make a difference to their lives. They see the researchers as valuing their ancestral knowledge. They are particularly interested in water issues (*no water-- no future*) since they rely predominantly on rainfed agriculture and women in their communities spend considerable time fetching water for domestic use.



Figure 4 Meeting with Arafah farmers in Sana'a

Some important issues from the community were raised. These would warrant further investigation in a phase II. For example, community members discussed the cost differential between local and imported food staples. As a norm, imported staples such as white wheat flour are being sold for less than the locally produced grain (Baladi wheat is 6,000 riyals/40 kg while imported wheat is 5,000/50kg). While this price difference can have a negative impact on food security from local sources, it can constitute an economic incentive for the continued production of local varieties which tend to be preferred for specialty dishes.



Figure 5 Community meeting in Arafah

According to farmers from Arafah, population has increased 10 fold in the last 40 years (from 300 to 3,000). They have fewer brothers and sisters than they have children, indicating a high survival rate in this generation as well as increased fertility which they explain by changes in infant feeding practices when women no longer breastfeed. This population increase has led to greater dependency on imported foodstuffs. Only families with large swaths of agricultural land can be self-sufficient. In the past, the Madafen or holes dug in the rock were used to store grain in anaerobic conditions. This practice has all but disappeared. **Understanding the role of the population pressure on the ecosystem and the available resources could be the basis for important research questions to be explored in the future.**



Figure 6 Fetching water in Arafah

Because of the segregated nature of the Yemeni society, separate meetings had to be conducted with the women. As a male consultant, I was able to meet with some women in Sana'a as a group but not in the communities themselves. Approximately 12 women were present, including elderly villagers, extension workers from the Ministry of Agriculture, and ladies involved with local NGOs.

The attachment women have for traditional food is evident and the value they attribute to it in terms of health is high. They are also aware of the pressure imported foods are

exerting on their incomes and the danger in rapidly losing the ancestral knowledge involved in growing the traditional crops and preparing the traditional dishes based on them.



Figure 7 Cow manure drying in the sun. It will be used as fuel in the cooking pit or "tannour"

The women were mostly open to **the idea of ecotourism-based food activities** floated by Dr. Amin Hakimi in the Manakha region and based on the Healthy Kitchen model in Lebanon. They believe that such activities have the potential for improving livelihoods for the local women and their families. They also stressed **the importance of having nutrition education in the communities**. Activities highlighting the nutritional benefits of the local foods would be particularly welcomed.



Figure 6 Looms at the women's organization in Robat al Qalaa

During the field visit to Robat al Qalaa and Arafah, a meeting with Ms. Mona who heads a women's association in Robat al Qalaa was held. This association is quite impressive and seems to be filling a glaring gap in the region. This successful organization can be used as an example for other Yemeni regions. It has the potential of rebalancing some of the deep gender inequities in Yemeni society. This organization is run by women for women and serves as a training centre in income generating activities. It can also offer health care services for women, education on home gardens, health education, small animal husbandry workshops, etc. The centre has also the potential of **including a tourist**

stop with traditional food being served. The kitchen being already there, it will need minimal improvements that could be easily integrated to the community development component of a potential phase II. The focus on women's education and livelihood is timely as they seem to be gaining increased means to access power especially with the feminization of agriculture brought about by men's migration in search of remunerated jobs in the cities and in the oil rich Arab countries.



Figure 8 Boy fetching water for drinking from an open pond near Arafah

Upon visiting the communities, it became clear that the project could leave its mark by providing important services to the communities such as in helping clean up the water reservoirs or assisting in water harvesting projects at the domestic level to reduce the time women spend fetching water.

4. Policy

On Saturday, July 5th, Dr. Lamia el Fattal, Dr. al Aswadi and the consultant held a series of meetings at the Ministry of Agriculture including a meeting with Mr. Abul-Hafez Karhash (General Director of Crop Production) at the Ministry (he had attended part of the workshop) and Mr. Saleh AL Beshi, Assistant Deputy Minister. Both were very interested in the HDD project and requested a brief summary in the form of a policy note (the existence of such a note has not been brought to the consultant's attention.) They also requested that a coordinating committee be formed consisting of key stakeholders, including policy makers, to begin to develop a second phase (the formation of such a committee was not reported in the project's final report.) They were interested in linking the project to the issue of food security.

In the view of this consultant, there is some danger in compromising the Ecohealth principles through the rash and urgent emphasis on food security. When ministry officials talk about food security, they seem to be supporting the model where quantity of cereal grain production is the focus. However, their apparent openness to the project team and the project result is however invaluable and should be capitalized on with a follow up on the idea of the committee and the current conjuncture regarding food security in Yemen is no doubt a major incentive for the policy makers in this regard.

5. Administrative and financial issues

Administrative problems existed in this project from the beginning and IDRC was quick to respond with a visit by the MERO regional controller—Mr. Sarwat Salem-- to the project to help resolve the issues. The power shift at the level of the YGRC and the disconnect between the new director and the project leader were translated into somewhat dysfunctional relationships among the project team and between the project team and the YGRC. For example, there was a general frustration felt by the team regarding the slowness with which money was being released for project activities. Effectively, the project was halted for a few months which is why it later needed a no-cost extension. Moreover, the change in the center directorship also meant that some team members stopped reporting to the center where all the data were housed. This resulted in an awkward situation where bits and pieces of the project data were stored on individual USB flash disks and computers. This situation can be very dangerous as valuable information could be lost. It is always advisable that projects consolidate their data in a central location and have external hard drives to store copies of files and regularly update these accordingly.

6. Conclusions and recommendations

The project *Health and Dietary Diversity in Yemen: Traditional Yemeni Rural Diets and Local Food Systems: Enhancing Contributions to Health and the Environment* has produced several important components of its stated objectives. The results remain fragmented and need to be consolidated. The research team is made up of talented, enthusiastic, and dedicated individuals who have established a relationship of trust with the communities. A second phase is desirable provided that effort is made to address some of the gaps in phase I and improve the development contribution of the work.

In a general meeting of the team on Saturday, July 5th, the team committed to providing the necessary work to successfully end phase I (please refer to Appendix IV for the minutes of that meeting). If the proposed work is satisfactorily fulfilled, the consultant believes that the research team should be invited to submit a proposal for a phase II of the project. It is however clear that strong outside research involvement is needed.

It is also recommended that each section of the final report be reported in Arabic and an executive summary be provided in English. This will allow every team member a chance to express their findings.



Figure 9 Team meeting

Below are some comments on the present project and recommendations for the future:

While the mapping of the ecosystem is impressive in its scope and meticulous execution, no systematic surveys were done on water utilization for drinking, washing, and irrigation. It would be important to understand how this scarce resource is being used in the communities and how health could be affected as a result.

The consultant has reservations about the medical work performed in the communities. While providing community members with information on their health status can be a valuable way to garner support, the consultant does not believe that the work in the current context will be of much use for research purposes. It would be important at this point, however, to provide solutions for the health problems encountered in the communities. A good example would be the infectious diseases and parasitic infestations caused by the drinking water. The agents possibly causing health problems related to water seem numerous (*E. coli* and nitrates in the drinking water). What are simple solutions to purify the water? For example, could storing water in glass containers and exposing it to the sun an option?

Community based approaches for the improvement of the water quality should be investigated and implemented with the help of the community members. It is also important to reemphasize the ethical obligation to provide anti-parasitic medication for affected individuals. In a future phase, systematic investigation of health problems with a particular age group would be desirable. Because of Yemen's poor statistics in terms of children's nutrition and health, it would be important to focus on this age group and investigate possible causes of the widespread stunting (mineral deficiencies, vitamin A deficiency, burden of disease, protein energy malnutrition, etc.)

The nutritional aspect of the work would benefit from more rigour in formulating the research question(s). There seems to be a clear strategy on what information needs to be collected but no clear vision regarding the questions these data will be answering in order to understand the possible local ways to improve the diet. The nutritional problems in the communities aren't clear. Is there low dietary diversity, is quality compromised? Is protein intake an issue? Are fruits and vegetables consumed in adequate amounts? Are

key minerals deficient in the diet? What would be local ways to improve diversity and quality? There's too much emphasis on the agricultural aspect (grains, varieties, cultivation methods, nutritive value of the varieties) and only lip service is paid to the overall diet. The potential is however tremendous. Based on Anhar Abdulkarim's work with traditional dishes, an ethnographic work on traditional meals could be initiated. What are the greens people consume? What is the source of protein in the diet? What is the food distribution within the household like? Are boys favoured in food allocation? Is the typical meal balanced? If not what can be done? All these are questions that the nutrition team should have strived to answer. At a time when food security is increasingly an issue, particularly in Yemen, assessing the quality of the diet alongside the quantity of the food consumed becomes essential. Many of the reported findings rely on questions that ask whether the current consumption is more/less/similar to the past consumption of a specific food item. These questions hold an important potential for memory bias and answers need to be interpreted with extreme caution.

All preliminary and participative work doesn't seem to be properly recorded. How were the workshops conducted? Are there pictures or minutes taken? What were the tools used to convey the message? What was the message? Was Power Point used as it was suggested? How does that work with mostly illiterate farmers? How were the women approached? The proper recording of the methodology would be crucial for replicability and improvement in the future.

The developmental aspect was glaringly missing from the project. Communities have been left with little other than almond saplings. However, the researchers themselves as well as community members have recognized the need for programs tackling health and hygiene education, vegetable gardens, small animal husbandry, water collection techniques, etc. Moreover, cleaning up the water reservoirs (Miklah or Makaleh) that got filled over time with sediments is something the project can provide as well as improving sanitation around the water sources.

It is also important to go back to the community with the results of the studies concerning the quality of the water, the diet, the agricultural techniques, etc. Have the community members been informed about the safety of their drinking water? If yes, were alternatives provided?

Below are some titles and questions that could be investigated in a possible phase II:

Food security and traditional food:

Anhar Abdulkarim's work could be the basis for phase II. Her description of the traditional food is essential if nutrient analysis is to be performed. How can traditional local food provide viable answers to the problems of food insecurity caused by high international prices? Can the quantity and quality of the food produced locally be sufficient for local consumption? Can the household or family production be improved in such a way to mitigate the negative effects of the international food crisis? Work should

also focus on bread. What are local varieties of bread that can provide a more balanced meal? Is the traditional custom of mixing cereals and legumes in bread making beneficiary? Could the lentil bread serve as a flagship? Since albumin results were showing possible protein deficiency, this food-to-food fortification technique needs to be recorded, studied, and possibly disseminated. An association with Dr. Katheeri from Hadramout University would be beneficial.

Food security in the Highlands of Yemen:

The emphasis should be kept on highland economies and a more thorough description should be provided. I propose zeroing in on one of the communities (Arafah) and recording the traditional agricultural methods and the ancestral wisdom in providing optimum nutrition and health. Gaps in the current system should be addressed and recorded. Arafah seems to have retained the most traditional lifestyle and diet. A systematic investigation of the burden of disease in this community in comparison with the others is warranted. Preliminary results are showing that people in Arafah are suffering less from chronic disease than in neighbouring Robot. Is this difference likely to be maintained if a larger sample size is recruited and the age group is better defined?

The household and the role of women in nutrition and health:

How can the household economics in the Highlands of Yemen be described? What are some coping mechanisms inside the HH? What's the difference between people with land and those without? For example, programs are being introduced to mechanize agriculture while landless people have traditionally managed to acquire food through an exchange for manual labour in tilling the land. Is mechanization a looming danger for these families? The role of the women needs to be better highlighted. How is decision making done in the household? How can women be given tools to improve the lot of their families?

The relationship between the ecosystem, food security and health:

Water, soil, genetic resources, indigenous knowledge about food acquisition and preparation make up the ecosystem which provides food and a source of health. What are the elements in the ecosystem that hinder proper nutrition and health? What are community members saying about the availability of water and the changing ecosystem? Has the disappearance of water sources mentioned by elders been recorded?

Would re-utilizing the disused dams that date back to the Hamirian era as well as household level water catchment be a viable solution for the increasingly scarce water resources? Would re-instating the traditional ways of protecting the water for drinking be possible in the current social climate? What are possible ways to improve the safety of using cow manure as fuel?

شعر ولف ونقشى \rightarrow كيف أختار العينة؟
سأليس ادا لم يكن في ارباب
الجنة د. هادي: تقم الواجعي
الغزالي د. عدنان وصف النمط العدائي
الصفحة المحلية د. أمين وصف الصفحات المحلية
البيئة الطبيعية د. هادي وصف الهائلة (التغيرات) د. نائل
وصف الهائلة (التغيرات) د. نائل

Figure 10 The outputs

Appendix I: CV for Malek Batal

Malek Batal
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Current Affiliations

University of Ottawa
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Honours Baccalaureate in Nutrition Sciences
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Degrees

Ph.D. Human Nutrition, McGill University, Canada, 2001
MSc. Food Technology, American University of Beirut, Lebanon, 1992
Teaching Diploma, Health Education, American University of Beirut, Lebanon, 1990
BSc. Nutrition and Dietetics, American University of Beirut, Lebanon, 1990

Employment History

2008	Associate Professor, Honours Baccalaureate in Nutrition Sciences, University of Ottawa
2007	Adjunct Professor, Canada Research Chair in Health Education, Université du Québec à Montréal
2002-2007	Assistant Professor, Department of Nutrition and Food Science, American University of Beirut
2005	Visiting Professor, School of Dietetics and Human Nutrition, McGill University
2003	Visiting Professor, School of Dietetics and Human Nutrition, McGill University
1996	Lecturer, School of Dietetics and Human Nutrition, McGill University

Professional Experience and Consultations (past 7 years)

2008	INTERNATIONAL DEVELOPMENT AND RESEARCH CENTRE (IDRC), <i>Evaluation of the project Health and Dietary Diversity in Yemen</i>
2006	WORLD HEALTH ORGANIZATION, Eastern Mediterranean Region <i>Consultant on the creation of a health communication manual for nutrition in the Eastern Mediterranean</i>
2003-2004	WORLD HEALTH ORGANIZATION, Eastern Mediterranean Region <i>Consultant on application of the CDCynergy workshop</i>

Graduate Supervisions

Completed: 12 MSc

In progress: 2 MSc, 1 PhD

1. Carine Issa, PhD Nutrition (2009, anticipated). *Étude sur la relation entre l'alimentation libanaise et les risques de maladies cardiovasculaires*. Co-supervisor. Faculté de Médecine de la Timone, Marseille.
2. Rasha al Jundi, MSc Nutrition (2008). *Development, implementation and evaluation of a nutrition education tool to target chronic disease risk factors in a Lebanese rural community*.
3. Maya Itani, MSc Nutrition (2008, anticipated). *The Nutrition Friendly School Initiative in three schools of Beirut*.
4. Cynthia Farhat, MSc Nutrition (2006). *Analysis of Indigenous Nutritional Knowledge, Cultural Importance and Nutritional Content of Wild Edible Plants*.
5. Rita Moujaes, MSc Nutrition (2005). *Dietary Habits and Nutritional Status of University Students in Lebanon*.
6. Lara Kallas, MSc Nutrition (2005). *Complementary Feeding in Greater Beirut: Patterns and Dietary Contribution*.

Graduate Students' Theses Committees Served

1. Joelle Zeitouny, MSc Nutrition, McGill University (2008). *Wild Edible Plant Consumption and Degenerative Eye Disease in a Rural Lebanese Elderly Population: A Case-Control Study*.
2. Samira Sidani, MSc Nutrition (in progress). *The effect of body fat on the incidence of metabolic syndrome indicators in adolescents in the Lebanese population*.

3. Khouloud Maatouk, MSc Nutrition (2008). *Pilot Project To Develop and Evaluate Obesity-Oriented Nutrition and Lifestyle Education Took Kit for Elementary School Children in Lebanon*
4. Maysan Marouf MSc Ecosystem Management (2005). *Assessing the Current Use and Significance of Wild Edible Plants Traditionally Gathered in Lebanon: An Ethnobotanical Study.*
5. Lynn Khatib, MSc Nutrition (2004). *Assessment of Anemia, Iron, Folate and Vitamin B12 Status in Lebanese Women of Childbearing Age.*
6. Michele Iskandar MSc Nutrition (2004). *Diet and Physical Activity as Determinants of Non-Communicable Disease Risk Factors in Lebanon.*
7. Annie Dekermedjian MSc Nutrition (2004). *Modification of Glucocorticoid Effects on Body Weight Gain and Plasma Lipids, by Changes in Diet Composition.*
8. Katarina Melzer, MSc Nutrition (2002). *Nutritional Status of Lebanese Children Aged 6-9 Years from Different Socioeconomic Backgrounds.*

Research Funding

Year	Title and Funding Agency
2006-2007	<i>Risk factors for nutritional inadequacy and suboptimal food choices</i> (50,000 Can\$) (Statistics Canada and Canadian Institute of Health Research, Ottawa) Co-investigator with Katherine Gray-Donald
2006-2007	<i>Wild Edible Plant Consumption and Degenerative Eye Disease in a Rural Lebanese Elderly Population: A Case-Control Study</i> (5,600 US\$) (University Research Board, AUB) Principal Investigator
2004-2006	<i>Wild Edible Plants: Promoting Dietary Diversity in Poor Communities of Lebanon</i> (200,000 Can\$) (International Development Research Centre, Ottawa) Principal Investigator
2005-2006	<i>Holistic Landscape Approach to Biodiversity Use in Lebanon: Partnering with Landowners</i> (234,128 US\$, Phase II), Initiative for Biodiversity Studies in Arid Regions Co-Investigator
2004-2005	<i>Holistic Landscape Approach to Biodiversity Use in Lebanon: Partnering with Landowners</i> (73,200 US\$, Phase I), Initiative for Biodiversity Studies in Arid Regions Co-Investigator
2004-2005	<i>Assessment of Nutritive Value of Two Mediterranean Fishes with Seasonal Comparisons between Species.</i> 8,000 US\$, (University Research Board, AUB) Co-Investigator
2004-2005	<i>Complementary Feeding in Lebanon: Determinants and Nutritional Adequacy</i> 6,500 US\$ (University Research Board, AUB) Principal Investigator

2003-2004	<i>Determinants of Infant Feeding Practices across Lebanon</i> 7,000 US\$ (University Research Board, AUB) Principal Investigator
2002-2003	<i>Nutritional Status of Lebanese School Children Aged 6-9 Years from Different Socioeconomic Backgrounds</i> 8,000 US\$, (University Research Board, AUB) Principal Investigator

7. Peer-Reviewed Publications

Saoud I.P, **Batal M**¹, Ghanawi J, Lebbos N. (2008). Seasonal evaluation of nutritional benefits of two fish species in the Eastern Mediterranean Sea. *International Journal of Food Science and Technology* 43, pp. 538–542

Batal M¹, Boulghourjian C, and Akik C (2007). Complementary Feeding Patterns in a Developing Country: A Cross-Sectional Study across Lebanon. *Eastern Mediterranean Health Journal (accepted)*

Obeid OA, Al-Khatib L, **Batal M**, Adra N, Hwalla N (2007). Established and suspected biomarkers of cardiovascular disease (CVD) risk in Pre-menopausal Lebanese Women. *Ecology of Food and Nutrition (accepted)*

Batal M and Hunter B. (2007). Traditional Lebanese recipes based on wild plants: an answer to diet simplification? *Food and Nutrition Bulletin* 28(2) suppl. pp. S303-S311

Saoud I.P, **Batal M**, Ghanawi J, Lebbos N. (2007). Seasonal variation in highly unsaturated fatty acid composition of muscle tissue of two fishes endemic to the Eastern Mediterranean. *Ecology of Food and Nutrition* Vol. 46(2), pp. 77 - 89

Al Khatib L, Obeid O, Mehio-Sibai A, **Batal M**, Adra N, Hwalla N (2006). Folate Deficiency Is Associated with Nutritional Anemia in Lebanese Women of Childbearing Age. *Journal of Public Health Nutrition* Vol. 9(7) pp. 921-927

Batal M¹, Boulghourjian C, Abdallah A, and Afifi-Soweid R (2006). Breastfeeding and feeding practices of infants in a developing country: A national survey in Lebanon. *Journal of Public Health Nutrition* Vol. 9 (3), pp. 313-319

Batal M¹, Gray-Donald K, Kuhnlein HV, and Receveur O. (2005) Estimation of Traditional Food Intake in Indigenous Communities in Denendeh and the Yukon. *International Journal of Circumpolar Health*. Vol. 64(1) pp. 46-54

Batal M¹ and Boulghourjian C (2005). Breastfeeding Initiation and Duration in Lebanon: Are the Hospitals “Mother Friendly”? *Journal of Pediatric Nursing*. Vol. 20(1) pp. 53-59.

¹ Corresponding author

Harakeh S, **Batal M**, and Barbour E (2003). Nutritional Consequences Related to “Mad Cow disease” Among Homemakers and Medical Care Practitioners in Lebanon. *Ecology of Food and Nutrition*. Vol. 42(3) pp. 241-254.

Research Papers Presented

- 2008 **Batal M**, Traditional Knowledge, Cultural Importance and Nutritional Content of Wild Edible Plants in Rural Lebanon. The Second International Conference on Health and Biodiversity (COHAB 2008), Galway, Ireland.
- 2007 Obeid O, Mehio-Sibai A, **Batal M**, Adra N, El Khoury D, and Hwalla N. Prevalence of the Metabolic Syndrome in the Adult Lebanese Population. The 10th Asian Congress of Nutrition, Taipei, Taiwan.
- 2006 Hunter E, **Batal M**, and Debailleul G. The Economics of Dietary Diversity: diet, food security and agro-biodiversity in rural Lebanon. Journées annuelles de santé publique, Montreal, Canada.
- 2006 Jeambey Z, Johns T, Talhouk S, and **Batal M**. Use, consumption and Health and Medicinal Properties of Six Wild Edible Plants in the Northeast of Lebanon. First World Congress of Public Health Nutrition, Barcelona, Spain.
- 2005 **Batal M**. Lebanese experiences with wild edible plants and dietary diversity. Paper presented at the Developing African leafy vegetables for improved nutrition: A Regional Workshop, Nairobi, Kenya.
- 2005 **Batal M.**, Farhat C. The potential of biodiversity –based traditional Lebanese recipes in improving dietary diversity and food security. Paper presented at the Biodiversity and Health Conference (COHAB 2005), Galway, Ireland.
- 2004 **Batal M.**, Breastfeeding Status in Lebanon. Paper presented at the 2nd Arab Nutrition Conference, Manama, Bahrain.
- 2003 **Batal M.**, Nutrition and Aging. Paper presented at the Nutrition and Optimum Health Conference, Beirut, Lebanon.

Date: September 22, 2008

Appendix II:

People met:

- Mr. Abul-Hafez Karhash (General Director of Crop Production), Ministry of Agriculture and Irrigation
- Mr. Saleh AL Beshi, Assistant Deputy Minister, Ministry of Agriculture
- Dr. Amin al-Hakimi, Team leader for the project 103153, Professor at the YGRC
- Dr. Muhammad al-Aswadi, Director of the Yemeni Genetic Resource Centre (YGRC), Sana'a University
- Dr. Mokhtar Othman Dept of Soil and Water, Faculty of Agriculture, Sana'a University
- Dr. Adnan Al Qubati, Department of Food Science, Faculty of Agriculture, Sanaa University
- Dr. Sadek Charaf. Medical Doctor and team member.
- Ms. Anhar Yany, M.Sc. student and member of the team.
- Ms. Mona (head of Women's NGO in Robat al-Qalaa)
- Ms. Hafiza Nasser Chaaban (Women Centre at the MoA)
- Ms. Najwa Abdeljabbar (Women Centre at the MoA)
- Mr. Frederic Pelat, Head of Iddeales (NGO).
- Dr. Muhammad al-Khatheeri, Dean of the Faculty of Food Science, Hadramut University
- Dr. Salem al Rammah, Dean of the Faculty of Agriculture, Sana'a University
- Dr. Lamia el Fattal, IDRC
- Farmer Ahmed Ali Mohammed
- Farmer Abdel Karim Ali hakim
- Farmer Yahya Abdel Ghafel
- Farmer Nasser Mohammed al Khodr.
- Various women and men farmers.

Appendix III:

Agenda of the two day workshop for the Health and Dietary Diversity in Yemen project

برنامج

ورشة الأنظمة الغذائية التقليدية اليمنية ودورها في الصحة والبيئة

اليوم الأول: 2008 / 7 / 2

الساعة	الملقي	البيان
9:40 – 9:30		1- الافتتاح بأية من الذكر الحكيم
9:50 – 9:40	د . أمين الحكيمي	2- كلمة فريق الدراسة
– 9:50 10:00	د . محمد الاسودي	3- كلمة مدير المركز
– 10:00 10:10	د . لمياء الفتال	4- كلمة منسقة المشروع
– 10:10 10:20	أ.د. رئيس الجامعة	5- كلمة راعي الورشة
– 10.20 11.30		6- استراحة + زيارة معرض

جلسة العمل الأولى :

رئيس الجلسة: أ.د. سالم عثمان الرماح عميد الكلية مقرر الجلسة : أ.د. مانع الهزمي		
12.15 – 11.30	المعارف المحلية التقليدية / والأصول الوراثية ودورها في حماية البيئة د/ أمين الحكيمي	1
12.30 – 12.15	استراحة الصلاة	2
1.15 – 12.30	المصادر الطبيعية و الأنظمة البيئية د/ مختار دائل	3
2.00 – 1.15	الجوانب الاقتصادية والاجتماعية د. احمد السماوي	4
6.00 – 3.30	جلسة مسانئة مفتوحة (تعزيز دور الإنتاج الزراعي تحت الظروف المطرية) رئيس الجلسة : د. محمد حميد الاسودي	5

اليوم الثاني : 2008 / 7 / 3

جلسة العمل الثانية:

رئيس الجلسة: د.فتحية بهران مقرر الجلسة: أ.د. عبد الجليل درهم		
9.45 – 9.00	الأغذية التقليدية وأنماط الاستهلاك الغذائي د/ عدنان محمد	1
10.30 – 9.45	المرأة والأنظمة الغذائية أ. أنهار عبد الكريم	2
11.00 – 10.30	استراحة	3

جلسة العمل الثالثة

رئيس الجلسة : المهندس عبد الرحمن سلام مقرر الجلسة : د.عبد لباقي الزعيمي		
11.45 - 11	الأنظمة الغذائية في اليمن د . محمد عاشور الكثيري	1
12.30-11.45	الحالة الصحية في مناطق الدراسة د.صادق	2

12.45-12.30	استراحة صلاة	3
1.15 – 12.45	التداخلات بين مكونات المشروع المختلفة السيد فريدريك بولا	4

جلسة العمل الرابعة:

<p>رئيس الجلسة: د. لميا الفتال مقرر الجلسة: د. محمد حميد</p>		
1.30-1.15	استعراض الطلاب م. منصور الصغير	1
1.45-1.30	استعراض الطلاب م. أنهار	2
2-1.45	تشكيل مجموعة عمل تتبنى التنسيق والدفع باتجاهات العمل المستقبلية والتوصيات	3

Appendix IV :

Unedited Minutes of Meeting with the research team on Saturday, July 5th, 2008.

The emphasis of Amin Hakimi's work should be on how managing existing varieties can best improve quantity and quality of production. There was talk of venturing in variety improvement. I would discourage that since the capacities of the centre don't seem to be able to handle such very specific tasks. The message that should come out is that the farmer's knowledge can help in management of the land with the ongoing dearth of the water. Important to help revive the ancestral knowledge being lost by the encroachment of new techniques based on the intensive use (or abuse) of the resources. Any research development should be shared with the farmer who is slated to become the ultimate beneficiary of the research work. A study of the effect of climate change on traditional knowledge and its capacity at problem solving should be investigated.

Al Qubati is interested in investigating the effect of seasonality more. Importance of indices to describe food intake as opposed to individual food items. Indices can be created to describe local versus imported food consumption for example.

For Sadeq's work to have any meaning, he should divide up his sample into age and gender groups. There's a big problem of parasites and anti-parasitic drugs should be made available to the researchers. He will be using z-scores and comparing his results to the WHO standards.

Dael: Are the traditional methods conducive to good health?

Samawi thinks that the survey was too large. I agree. Too much info that won't be used.

The project created awareness about pesticides and fertilizers and about the wheat crisis.

Was behavioural change achieved and how?

Anhar: Documentation of diversity. Important to disseminate the cookbook. Documentation of the methodology is important especially that the methods used seem quite complete: observation, interview, recording, repetition, etc...

Important to summarize methodology and to critique it. Was it reliable, was the sample representative? Was it big enough?

Importance of a thorough literature review and important to link the lit review with the work. What are the major problems in Yemen?

Sadeq: description of the area, comparison with standards.

Al Qubati: description of dietary intake, creation of an index of local consumption, collaboration with Anhar, association between intake and production of the food.

Amin: description of local varieties, improving local capacities and local knowledge, improving the relationship between farmers and researchers, improving relationship between policy and research.

Natural environment: Mokhtar: describe each region and the changes that are occurring, document elder's information, relate the changes to the changes in health, document the composting case study with Yahya the farmer.

Social and economic environment (Dr. Samawi): description of the social and economic environment. Find relationships between economic situation and various nutrition and health outcomes if possible. Comparison between regions. Importance of data collectors' training and working on education.

Traditional knowledge: rigorously collect data concerning agriculture management, diet, and health and assess benefits in solving current nutrition and health problems.