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Fakulteten för landskapsplanering, trädgårds- och jordbruksvetenskap
Institutionen för landskapsarkitektur, planering och förvaltning

Battling ”Hidden Hunger” by gardening

– A kitchen garden design addressing micronutrient deficiencies in rural Tamil Nadu, South India

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Summary

Micronutrient dificiencies, so called ”Hidden Hunger” is a wide spread global problem. Indications are that horticultural intervention through gardening could be an effective method of combatting the problem in developing countries. This thesis combines a field study examing the background and physical possibliities associated with gardening in South India with a garden masterplan with focus on battling hidden hunger.

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1. Introduction

About one third of the world population is estimated to suffer from micronutrient deficiency due to a diet lacking essential vitamins and minerals. This phenomenon is called 'Hidden hunger,' as its symptoms are not as obvious as the visible symptoms of lack of food. Its consequences however can be devastating and hidden hunger is a great threat to public health in developing countries and should be taken serious.
Horticultural intervention could prove to be an effective method of combatting malnutrition problems in poor areas (Chakravartry, Indira, 2000). The diverse structure of a garden can offer a wide range of nutrient rich crops on a very small area as well as providing other beneficial effects, such as diverse and stable supplies of socio-economic products and benefits, increasing food and income security as well as local biodiversity over a long term time perspective. During the spring of 2013, I had the opportunity to conduct a 8 week minor field study financed by SIDA (Swedish International Development Agency) and spent February and March in a rural area located near the town of Nilakottai in Tamil Nadu, the most southern state of India. In this thesis I will present the result of this field study and discuss the possibilities and limitations of designing small-scale productive gardens as a tool to fight hidden hunger on a local basis.

2. Background

2.1 Hidden hunger

Hidden hunger is defined as chronic lack of minerals and vitamins due to one-sided food consumption. Symptoms are not as obvious as normal hunger but its consequences are nevertheless disastrous: hidden hunger can lead to mental impairment, poor health and productivity, or even death (Micronutrient Initiative). Vitamin A together with other micronutrients such as vitamin C, iron and folic acids are essential to maintain normal health and performs several critical functions in the human body. Nearly half of childhood deaths in India are caused by acute respiratory tract infections and diarrhoeal infections which both can be related to vitamin A deficiency (Chakravarty, Indira, 2000).
This issue is not necessarily associated to hunger or lack of food. The UN report on Food and Agriculture states that although India is a net exporter of food with millions of tons of grain in storage, 47% of its children are malnourished (U.S Division for Sustainable Development, 2012). This means that even if the agricultural food production is high, the access of nutritious food is still scarce. During the "Green revolution" launched in Asia in the 1970s labour- saving techniques, chemical fertilizers, new seeds and pesticides were introduced to farmers on a big scale basis to boost food productivity. The crops that were encouraged mainly consisted of staple grains like wheat and rice, rich sources of

carbohydrates, but with low amounts of protein and other nutrients required to meet nutritional needs. Farmers used to maintaining more diversified agricultural systems including pulses and legumes before the revolution, were pushed towards less diversified methods with higher concentration of a few staple crops. This may very well be a contributory factor leading to simplified diets, undernutrition and wide spread hidden hunger in South Asia (Burchi, Fanzo, Frison, 2011).

2.2 Strategies to fight hidden hunger

There are a number of models to promote and make nutritional food available through out the developing world, often called "food based strategies". In recent years some programs, taking a more holistic approach, integrating different components with focus on agricultural production, land use, nutrition education, food supplementation and basic health care have emerged as a mean to strengthen food security (Burchi, Fanzo, Frison, 2011). The basis of the food based strategies are normally based on a few widely used models.

2.2.1 Supplementation

Vitamin A supplementation distributed to children as a high dosage capsule is the most widespread strategy to alleviate vitamin A deficiency. The capsule is most commonly distributed twice a year and is claimed to be a very cost effective method. Supplementation programs are coordinated by GAVA, (Global Alliance for Vitamin A) an informal partnership between; *Micro nutrient Initiative, UNICEF, WTO, (The World Health Organisation) CIDA, (Canadian International Development Agency), US AID, Helen Keller International* and the *World Bank* (Micronutrient initiative).

2.2.2 Food fortification

Food fortification is the adding of vitamins and minerals (called "fortifiers") to common foods (called "vehicle foods") like rice, flour, oil and sugar. The vehicle must be chosen carefully to assure it is consumed by many, and the strategy must be complemented by education to increase the demand for the fortified products and other interventions targeting increased diet diversity and quality (Burchi, Fanzo, Frison, 2011).

2.2.3 Biofortification

Biofortification is a method of breeding crops to increase their nutritional value, either by traditional selective breeding techniques or genetic engineering. The strategy aims to increase a specific micronutrient to a target population. The

technique have shown to be effective, increasing vitamin A intake largely among young children in a project promoting consumption of biofortified orange fleshed sweet potato in Mozambique (Low. JW et al. 2007).
Golden rice is another example of a biofortified crop. The golden color derives from the beta carotene genetically modified into the rice as a source of Vitamin A. Promoters claim that distribution of the rice could have strong positive impacts on global nutritional status (Tang.G et al. 2009). The genetic engineering however, meets strong criticism from the environmental movement and golden rice have been widely debated (GM watch, 2012).

2.2.4 Horticultural intervention and kitchen garden promotion

One solution may lie in small scale productive gardens. In ”Food based strategies to control vitamin A deficiency” Indira and Chakravaraty argues that ” *Horticultural intervention combined with extensive nutrition education is recommended as the major long-term and most sustainable food-based strategy to control and eliminate micronutrient malnutrition”* (2000). The project “Integrating homestead gardening and primary health care activities in South Africa” is a proof of this, showing positive results increasing vitamin A consumption among children by educating the mothers on the importance of vitamin A in human nutrition along with trainings in vegetable growing (Burchi, Fanzo, Frison, 2011).
The “Helen Keller International”, one of the oldest NGO’s, (Non Governmental Organisation) as well as one of the major organisations working with malnutrition prevention, run programs promoting and facilitating homestead food production in Bangladesh, Nepal, Cambodia and the Philippines. They provide technical and managerial support and start-up supplies such as seeds, saplings, and poultry to local NGO’s integrating food production in their activities (Helen Keller International, 2013).
This program has led to a substantial increase in dietary diversification, and has reduced the prevalence of childhood anemia (Helen Keller International, 2013). Their own studies show that participants of the program eats 1.6 times more fruit, run less risks of night blindness, and that it has generated more than 190. 000 jobs, mainly among poor women in rural areas (Helen Keller International, 2013).
Relatively few garden projects have been evaluated to their impact on vitamin A status, but according to UNICEF, may nonetheless be a valuable complement to fortification and supplementation as a long term strategy also generating income. Maybe especially on the Indian sub-continent where a very high percentage of vitamin A in the diet derives from horticultural crops (Burchi, Fanzo, Frison, 2011).

2.3 Study setting

Tamil Nadu is the most southern state of India. The people refer to themselves as Tamils and they speak the language Tamil. The Tamils traditionally and still are very protective of their politically autonomy and their culture. The dominant religious course is Hinduism. Distinctions between religion and society or religion and culture, which are common in the West, are vague in Hindu tradition (Fuller, 2004).
The study was conducted in the surroundings of Nilakottai town in the Dindigul district in the inland of Tamil Nadu. It is a rural area where the people are mainly engaged with small scale agriculture and living standards are generally low with minimum monthly salaries typically around 3000 rupiees (43€), around 60 % of the children attend school up to 12th grade and about 30% proceed to higher education (K.A Chandra, personal contact, 2013). People live simply and most houses have no access to toilet facilities. Health care centers and hospitals are distributed through out the area, but costs are often too high to be prioritized.
Center for Improved Rural Health and Environmental Protection (CIRHEP) is an NGO that has worked with sustainable rural development in the area for over two decades. Their project range from natural conservation and restoration of the *Kadavakuruchi Forest Reserve* to women's self-empowerment projects and promotion of sustainable land use and organic agriculture (CIRHEP, 2013). To run different projects they receive funding from a number of organization's, among them the Swedish NGO *"Framtidsjorden"* (Future Earth). In 2013 they received funding from the Indian *National Bank for Agriculture and Rural Development* (NABARD) to run a project on the promotion of kitchen gardens.

3. Purpose and study questions

The purpose of this thesis is to study possibilities and limitations of designing small scale kitchen gardens to battle poverty in general and micro nutrient dificiencies in particular in the rural area of Tamil Nadu in South India. The data obtained through the field study are then being presented through a garden design master plan that could be an educational tool in awerness programs aimed to adress local focus groups.
These are my study questions:

- What micronutrient rich plantmaterial could be used and promoted through the design?
- Which gardening techniques can be suitable to ensure good productivity and maintaining long-term soil fertility and what soil improvement resources are locally available?

- What elements could the garden contain to communicate its educational values to local focus groups?

4. Limitations

This study is done from a landscapers point of view and as a landscaper my role have been to evaluate aspects regarding the physical planning and implementation of a kitchen garden with the purpose of inspiring to further gardening, and to show relevant plants and techniques to grow micro nutrient rich crops in a small scale setting. In depth explanations regardning socio-economic aspects, the metabolistics of micro nutrients and pedagogic measurements are just briefly, or not at all dealt with.

5. Methodology

Most of the research for this thesis is based on a 8 week field study on-site in the rural area surrounding the small town of Nilakottai in Tamil Nadu, South India. Research here was mainly done with a qualitative approach, consisting in informal, conversational interviews and more standardized interviews based on interview guides with primarily open ended questions. A vast portion of the data gathering from the area is based on first hand observation since site specific information on available resources, plant material and micro climate is impossible to obtain through published academic articles. Due to the lack of litterature and internet connection on-site, most of the litterature studies have been done either before the field study, gathering background information on hidden hunger and locally situated development and gardening initiatives, or after the fieldstudy, complementing on-site data. This methodology will enabled me to gather the neccessary basis of information to present the result of the study through an elaborated design plan targeted to meet the demands of an educational garden specified to the area.

5.1 Literature study

The literature used in this thesis can be divided into two categories:
1. Data regarding "Hidden hunger , micro nutrients and deficiencies is obtained through academic articles or information mainly published on the internet. A majority of literature on the subject derives from aticles and publications published by organizations and global organs working with poverty prevention programs such as UNICEF, Micronutrient Initiative etc.
2. Data regarding gardening and plant material was obtained through books or in some cases articles published on the internet. Gardening literature chosen have an organic approach to gardening in most cases or deals with gardening in tropic or/and semi arid climates.

5.2 First hand observations

First hand observations have been a useful method gaining a more overall picture of the local region, land use, available resources and cultural aspects regarding the every day life and habits of the local population. It was also vital during the process of understanding the specific site of the kitchen garden plan, inventoring existing plant material and understanding the microclimate, movement patterns and other factors of relevance. The observations were recorded in a log book and/or photographs.

5.3 Interviews and interest groups

The interviews were conducted with a qualitative approach and I have chosen to divide the informants into different interest groups, giving each interest group a capital letter:
Interest group A: Local landless women without kitchen gardens
Interest group B: Local landless women with kitchen gardens
Interest group C: Organic growers and project managers

Except these interst groups I also conducted complementary interviews with a social worker at the health department and with an employees at CIRHEP.

5.3.1 Interest groups A and B

To gain an understanding of local food consumption habits and actual conditions regarding garden growing I sought out six appropriate women in the local community. Three of these women are landless and do not grow any gardens. The other three women were also landless but were growing kitchen garden to some extent.”Landless” is defined as people not owning any agricultural land, but the accsess to spaces suitable for gardening can differ within the definition as some “Landless” have accsess to smaller spaces in proximity to their houses, but some have no access to private space at all. For both groups I used interview guides with predetermined, mostly open questions (see Appendix). I chose these interest groups to be able to see if there were any differences in habits and consumtion patterns that could be related to gardening. It was also an excellent opportunity to examine why these women choose to or not choose to grow gardens. The interviews were made before the design plan and the information gathered from these interviews have been used as guidelines in the design. All of these interviews were conducted with the help of the same interprenter, but due to the open ended questions designed to enable discussion, the interviews sometimes tended to become conversations between the women and the interprenter. It is impossible to know how much of these conversations I actually was able to grasp, but I tried to make sure to get as much as possible translated wich often had me asking the same questions over again to be certain of the answer.
The interviews with interest group B were always followed by a visit to the

gardens which helped me gain insight in gardening techniques and productivity.

5.3.2 Interest group C

The informants of interest group C were chosen because of their skills and professional experience in gardening in actual climate conditions, and because of their involvement or former involvement in non-profit projects aiming to encourage gardening among local communities. The interviews were without exeptions informal and conversional to enable the informants to share their experiences and knowledge without the limitations of a pre-written guide. I tended to control the subject discussed but tried to avoid interferring to much with the natural conversation flow. This technique proved to be a little more labour intensive recording, but had good results since the informants were free to discuss various topics, sometimes giving me valuble feedback on topics I would not have thought of in advance.

Bernard Declerq, Pebbles Garden
Bernard Deqlerq is originally from Belgium but since more than 30 years he is a resident of Auroville in Tamil Nadu. Here he runs a horticultural farm called ’Pebble Gardens’ together with Deepika. When he bought the land 1996 it was a wasteland with severely degraded and lateritic soils. Together with Deepika he has developed techniques to grow trees, fruits and vegetables on the degraded soils and now he grows more than 80 hardy varities of vegetables, herbs, flowers, cover crops, root crops and medicinal plants on his 7 acres (=28 328 m2). They have a strong focus on seed conservation and shares hardy varities of mainly vegetables to other organic growers through organic fairs, seed exchange programs and private references. Bernard was also one of the initiative takers in the forming of ARISE, (Agricultural Renewal in India for Sustainable Environment) a network dedicated to the promotion of sustainable agriculture nation wide (United Nations Publications, 2002).

Krishna Mckenzie, Solitude farm
Krishna Mckenzie is originally from the United Kingdom, but came to India at the age of 19. Since 1996 he have been running the ‘Solitude Farm’ in Auroville, Tamil Nadu. On this 6 acre (2481 m2) he grows indigenous rice and millet varieties, a wide range of vegetables, pulses and grams and 16 varieties of fruit trees. The produce is sold as food through the farm’s organic restaurant and twice a week he also distribute produce to a number of clients through a community supported agricultural programme.

Elumalai, Heal The Soil
Elumalai is Tamil, born and raised in Tamil Nadu and since three years he is a project manager of ‘Heal the soil’, an organization that focuses on starting up small scale kitchen gardens in village homes and provide seeds and

permaculture-training. At the time of my visit in February 2013, the organization were running five kitchen gardens in the small village of Kottakarai where they also run a small farm, providing training and accommodation to international volounteers.

5.3.3 Complementary interviews

Mahalakshmi, supervisor and social worker, Integrated child development scheme, Social well fare department, Nilakottai.
Mahalakshmi is a well informed professional working with awerness programs regarding micro nutrient deficiency on a daily basis and provided a lot of information on the local health status and dynamics of the awerness programs.

A. Sathiya Seela Employee, Center for Improved Rural Health and Environmental Protection (CIRHEP) Nilakottai.
Sathyia works with, and organizes different village awareness programs aiming to alleviate poverty and provide education with the active participation of the local community. Her practical experience in pedagogics combined with her intimate knowledge of the rural community was a great source of knowledge.

5.4 Interprenter

Many of the interviews have been made with the help of an interprenter. In most cases I have used the same person, but in a few cases she was not avialable and I had to use someone else. In all cases my interprenter have been a person with higher education involved in the work of CIRHEP. There are many disadvantages of not knowing the language of the informant and having to rely on an interprenter. You can never be quite sure that the interprenter give you the full meaning of what is being said and a translation sometimes fails at communicating the exact same meaning or feeling as the original statement. Sometimes this is even inpossible due to language and cultural differencies and without and intimate understanding of the culture it can be very hard to snap up underlying contexts of what is being told. With regards to this I am very pleased with the collaboration with these interprenters and I am confident that no bigger misunderstandings have been made.

5.5 Visual Approach

Parts of the results are presented as visual-spatial information, with illustrations and plans to illustrate the different concepts in the design (Dee, 2001).

6. Results

The results of the study are partly presented through a design plan with the intention to visualize an awerness concept in fighting hidden hunger and answering the study questions. The plan is incorporating a number of design components with pedagogic and aestetic values based on the results from the study regarding local food habits and gardening practises. Requirements and design components are explained in text and are also demonstrated in the *Proposed design plan,* Appendix nr 2.

6.1. Site analysis

The climate of Tamil Nadu is semi- arid with a local average rain fall of 836 mm in the Dindigul district. Most rain fall arrive during the North East monsoon, October to December with a dry period during the winter months of January and February (Central Research Institute for Dryland Agriculture, 2012).

Rainfall	Average (mm)
Jan-Feb (winter)	45
March-May (summer)	155
Jun-Sept (SW monsoon)	218
Oct-Dec (NE monsoon)	418
Annual	836

Table 5.1, Annual rain fall, Dindigul district (Central Research Institute for Dryland Agriculture, 2012)

Temperatures are relatively high ranging from 26 C° to 38 C° (Tamil Nadu government).
The kitchen garden site chosen by CIRHEP is located at their training center and measures approximately 100 m2. It is a dry habitat exposed to the sun. The site is sheltered from strong winds from all angles. Trees around the northern and southern perimeters of the site, together with the dining hall and the dormatory on the east and west sides of the garden, provide wind barriers aswell as some shade from the scorging sun (first hand observations, see Appendix 1). During the morning the sun reaches down the western parts of the garden, moving into the central parts during midday. Around 1 PM the sun reaches the maximum surface space, covering most parts of the area, moving to and the east side in afternoon and evening. Water can be pumped from a open well situated south of the garden to irrigate. A pattern of previous vegetable garden attempts in a circular shape can be detected (see Appendix 1).

6.1.2 Soil

Black Soil and Red Sandy Soil are the two dominating soils of Nilakottai district according to the District General Statistics (2006). At the appointed site for the kitchen garden, soil samples based on simple sedimentation of three samples in three different water jars, led me to classify the soil as a Red Sandy Loam containing some clay and also organic matter, but with the majority of red sandy particles. Soil samples extracted from beneath the canopies of trees surrounding the garden space showed a slightly higher content of organic matter than samples taken from areas without a canopy. No pH tests were conducted but the soils in the area are according staff at CIRHEP slightly acidic with a pH somewhere between 5-6.

6.1.3 Available resources

The promotion of locally available plants, materials for soil improvement and basic structures can inspire the target group to make usage of resources present in the study setting, illustrating that there is no need to bring in expensive material from a far, saving both money and time. This will also have additional values such as sustainability aspects, promoting recycling of materials and a lessened climate impact avoiding fossil fueled transports. Using local material hopefully decreases the dependency of a global market and global market prices. Results from the study show that there are a number of locally available resources that could be used in the design. Organic matter for soil improvement and construction materials like bamboo and palmkeet can be found in the setting. Hard surface materials for paving are harder to come by and expensive to purchase. The most commonly consumed vegetables (listed under Raised vegetable beds 5.4.3) can be found as seedlings on local markets. Traditionally grown and consumed vegetables, mainly leafy vegetables wich have low market values can be found in cultivation sporadically in gardens or growing wild on fields in the study setting. Seeds are available through different agriculture networks like ARISE, exchanged informally between growers or can be purchased from the botanical garden of Auroville (Interest group C).

6.1.4 On site plant material

A number of trees or shrubs already planted around the kitchen garden site (see Appendix 1). Only the names, common uses and possible nutritional properties of intrest are listed. The information derives from CIRHEP's own inventory lists of planted material which is based on various botanical books on the local flora. If the plant has properties relevant to the study, additional information is given. The number indicates the position on the Actual site map, Appendix 1. Note that some of the trees have been removed in the Proposed design plan, Appendix 2 to give room for other vegetation.

Terminalia bellerica, Bastard myrobalan (1)
Large deciduous tree used for timber, ornamental purposes and the seeds are called bedda nuts and are used in Ayurvedic medicines.

Citrus aurantifolia, Key Lime, Elimichchai kai (2)
Small deciduous tree. Fruits rich in Vitamin C.

Artocarpus heterophyllus, Jackfruit tree (3)
A Large tree producing big edible fruits with high vitamin C and some vitamin A properties (USDA, 2011).

Hibiscus rosa-sinensis, Rose mallow, Chinese hibiscus (4)
Evergreen shrub or small tree with red brilliant flowers. Ornamental value and edible flowers. Nutritional value unknown to study.

Phyllanthus emblica, Indian gooseberry, Nellikkai, Aamla (5)
A deciduous tree that produces a small fruit with the same name, often pickled and commercially available in the study area. The fruit is a good source of vitamin A, C, potassium and manganese (USDA, 2011).

Azadirachta indica, Neem tree, Vembo (6)
A evergreen tree native to India. In Tamil Nadu the young flowers are used to prepear a dish called Veppampoo Rasam. The essential oil is used as an organic pesticide and neem cake is used as a organic fertilizer in local organic agriculture practises (interest group C). The bark is used to prepear an infusion to cure stomach problems.

Diospyros ebenum, Ceylon ebony (7)
A medium-sized evergreen tree that yield ebony hard wood.

Manilkara zapota, Sapodilla tree, Sapota (8)
A small, long- lived evergreen tree. Fruits are eaten fresh and are rich sources of vitamin C (USDA, 2011).

Swietenia mahogani, West Indies mahogany (9)
A medium- sized evergreen tree grown for its wood commonly known as Mahogany.

Duranta plumieri, Golden dew drop, Prickly duranta (10)
Evergreen shrub often used as ornamental hedges with lilac flowers.

Terminalia catappa, Indian almond (11)
A large tropical tree mainly grown for its ornamental values, but that also produces edible nuts. Nutritional value not known to study.

Pongamia pinnata, Indian beech (12)
A medium- sized tree often planted as ornamental tree or shade tree. Nitrogen fixing. The tree could be regualry coppiced to provide nitrogen rich mulch.

Peltophorum ferugianum, Copper pod, Perunkonrai (13)
A medium-sized deciduous tree grown for ornamental purpose or as a fodder crop. Member of the Fabaceae family and nitrogen fixing. Leaves can be used as soil improver (World Agroforestry Centre).

Murraya koengii, Curry tree, Karuva illaiy (14)
A small evergreen tree native to India and Sri Lanka. The leaves are widely used in South Indian cousine as a leaf vegetable and spice in traditional dishes like curries and sambar. The leaves are a good source of Vitamin A and Iron (TNAU Agritech Portal, 2004).

Annona squamosa, Sugar apple, Seetha pazam (15)
A small deciduous tree or shrub with edible fruits rich in Vitamin C

Carica papaya, Papaya, Papalli pazam (16)
A large tree-like plant that grows up tp 10 meters with large edible fruits rich in vitamin A, vitamin C and folate (Self Nutrition data).

Ficus bengalensis, Banyan tree, Allamaram (17)
A giant tree that eventually can cover hectares. Strong religious value and considred sacred in Hindu tradition (First hand observation, Plant cultures).

6.2 Design aims

The aims of this kitchen garden design plan is to create a platform and showcase garden to illustrate potential crops that can be grown to provide adequate micro nutrients and to show gardening techniques suitable to the climate using locally available materials and resources. To communicate this to local focus groups, using a pedagogic approach adapted to the cultural and social context is of great intrest. In a context with relatively high iliteracy rates (Government india, 2011), creating a room that communicates a concept for hidden hunger-prevention visually, could reach a broader audience. Since the prerequisites regarding available space varies within the targeted interest group, the garden is not meant to be an example of how one specific kitchen garden could be planned, but rather a selection of different techniques that could be applied in various settings. Located at CIRHEP, resources and space are not as scarce as in the homes of the targeted interest groups, but the different methods of gardening demonstrated in the design, should be easy to adapt in more limited settings.

6.2.1 Nutritional values

The main objective with the kitchen garden is promoting the consumption of a wider diversity of nutritious vegetables and fruits in general and focusing on rich sources in Vitamin A and Iron in particular, beeing the two major micro nutrient dificiencies in the area (complimentary interview Mahalakshmi, Chakravarty 2000, Unicef, 2009).

6.2.2 Pedagogic value and educational aims

The kitchen garden should be of educational nature, communicating information on micronutrients and the importance of a diverse food consumption visually through the design. The different elements of the garden should give illustrative examples of different garden scenarios targeted to encourage gardening and

diversified diets and provide inspiration on different techniques. From interviews with the project leaders of interest group C, they all agreed on certain aspects regarding what pedagogic approach should be taken to have an effect on the local community:

- Written information on signs or likewise should be in the local language Tamil rather than English.
- Additional information communicated orally should be provided through someone native tamil, preferably a person with anchoring in the local community.
- The change of habits and diet should rely on the promotion of locally existing plants rather than trying to introduce exotic fruits and vegetables not previously known to the target group.

(Interest group C, complimentary interview Sathya, Thielgaard Andersen et al, 2001)

The targeted intrest group is women, and landless women in particular. There are several reasons to try to reach these women through the design. Spending a lot of time with families in the area, it was obvious that the women generally are the ones in charge of house hold chores and providing food for the family and the children. This observation was also backed up by several accounts in interviews with women from the interest groups and complimentary interviews. In a typical family, women are not in control of house hold economy, and being in control of homestead food production could possibly empower the women to increased autonomy. One study in India showed that higher autonomy among women, indicated by access to money significally lessened the risk of having a stuned child when compared with women with less autonomy (UNICEF). It was also clear from interviews and observations that single mothers with children were among the poorest in the community, often dependent on irregular and badly paid day-labour work as the their only mean of income, earning 400 rupees (5.6 €) a month (Interest group A, B, complimentary interview Sathya). One woman told me that she regulary brought weeds from the labour work home to cook as a mean to feed her two boys, not having enough money to provide other than subsided rice and left-over vegetables from the market if not doing so (Interest group A).
Providing these women with the means of gardening could have a huge positive effect in their daily life, providing both nutritious food, possible extra revenue and a sense of independence.
In the study area, public information and advertisement is often comminicated through murals painted on walls. For this reason I suggest any written information on the subject of hidden hunger to be painted in Tamil on the two walls facing the garden. The information should be complimented by personal guidance from a project leader at CIRHEP.

6.2.3 Sustainability

I have strived to base the design on a economically- and ecologically sustainable theme. Resources, especially the access to water are scarce and with the majority

of the population not having access to private wells, being independent on govermental provided water distributed during an hour every second day, (first hand observation) a sensitive water scheme is crucial. Further more, with scientific evidence of climate change happening and with estimations that lowcapital agriculture is more sensitive to climate changes, (Dinar et al. 1998) the promotion of water retaining gardening techniques should be considered as a pedagogic element in the design.
The promotion of locally available resources is an important factor, introducing techniques not dependent on resources that have to be purchased or brought from a far. This hopefully enables garden growers to continue gardening not being dependent on global market prices on fertilizers, seeds or other. The promotion of organic gardening techniques and the increased usage of organic matter also enhance long term soil fertility and the micronutrient uptake of plants, (Edward Raja, 2009) crucial to the purpose of the garden. Gardening could also contribute to a more economically sustainable livelihood. Interviews with women from interest group B concludes that gardens can comtribute to increased self reliance. All women interviewed from interest group B considered their garden to be of economic value for their household and said to eat homegrown vegetables and fruit 3-7 days a week depending on season and the relation in size between their gardens and number of family members. One woman stated to save two thirds of food costs during the good growing season August- October (Interest group B).

6.2.4 Proposed plant material

Rather than introducing exotic crops this design focuses on the promotion of traditionally used and locally distributed plants, many of whom have no commercial market in modern day.
Local food habits include a range of vegetables. Interviews and first hand observations showed that vegetables like tomato, onion, carrot, brinjal/eggplant, drumstick and gourds are used and available in markets (Focus group A, B). A nutrition survey carried out in northern Tamil Nadu in 2011 conclude that *"the most commonly consumed food groups were cereals (the majority being white rice), oil and 'other vegetables', each consumed by over 95% of the respondents*." (Berggren Clausen, 2011) People so poor they have no access to these are relatively few in the study setting. Fruits are available but considered a costly luxury by many of the informants with the exception of grapes, papaya and mango that are all locally available and relatively cheap during harvesting seasons. 58 % of informants in the survey of Bergren-Clausen had been consuming vitamin A rich vegetables, tubers, fruits or leaf vegetables during the last 24 hours (Berggren Clausen, 2011). According to informants from interest group C, green leafy vegetables, in Tamil collectively known as "*Keerai"* are traditionally eaten, but nowadays neglected by many as a "poor mans food", often growing as weeds on agricultural farmland.
My selection of crops focus on a wide range of Vitamin A and Iron rich leaf vegetables but will also include plants with other purposes. Some of the traditionally eaten leaf vegetables are attractive and are being used as ornamental

plants in other parts of the world. Using them in a new context might inspire the local consumption of traditionally eaten, but now neglected leaf vegetables. Along with leaf vegetables, space will also be planned for the cultivation of other vegetables, fruits and flowers. With several fruit trees already present on site, no new trees will be proposed. Proposed plans must also be suitable for the local climate and habitat explained in the *Site analysis* 6.1. Planned plant species are listed with a short introduction of plant specific information regarding edible part of plant, uses, nutritional facts and habitat. Nutritional content is in most cases gathered from two different databases; *United States Agriculture Department's (USDA) Nutrition database*, and *Self Nutrition database*. Some species with extra importance to the design are described more in detail and these are listed first. Names are given in Latin, common English and Tamil.

Amaranthus tricolor L syn. *A. tristis,* Amarante, Kupei keerai
Leaf vegetable
Among the numerous Amaranths used as leaf vegetables, *Amaranthus tricolor* syn. *tristis* is the most important species and a major leaf vegetable in South and South East Asia. It is eaten cooked or raw in salads. Micronutrient content is high in comparison with other vegetables, and it is also a good source of protein. There are many cultivars on the market and several commercial cultivars has been developed at *Tamil Nadu Agricultural University* in Combiatore.
Amarante is a fast growing, annual herb that grows best in well drained, fertile soils in air temperatures above 26 C° (Grubben, 2004). It grows aproximately 50 cm high and produces compact seed clusters in various colors (Rockström, 1988). There are cultivars grown for ornamental purposes, known as "*Bahji"* in India. Amarante is considred a easy, nutritious, productive and tasty plant that can be grown in mono- or polycultures with no need for crop rotation (Grubben, 2004).

Amaranthus cruentus L syn. *A. paniculatus,* Indian spinach, Poon keerai/ Sivappu mulai keerai
Leaf vegetable
Amaranthus cruentus is widely cooked and used as a leaf vegetable in South East Asia and Africa. The plant contains high concentrations of essential micronutrients and comparing with other leafy vegetables, levels of vitamin A, vitamin C, calcium, iron and folate are remarkably high. The concentration of micro nutrients differs greatly with cultivar and soil fertility, with higher nutrient consistancy in fertile soils. The seeds are often promoted as health food in western countries and the protein content is excelent due to its high levels of lycine.
Indian spinach is a fast growing often reddish annual herb that can reach hights up to 2 meters. Because of its fast growth it can compete with weeds who seldom become a problem in cultivation. It can be grown solo or intercropped with other plants and prefers fertile, well drained soils in sunny conditions in day

temperatures above 25 C°. The plant has ornamental properties and cultivars bred for the aestetic value are commercialized. Amaranths respond positively to high rates of organic soil matter because of its great need for minerals (Grubben, 2004).

Basella alba, Ceylon spinach, Malabar spinach, Kodip pasali
Leaf vegetable
Native to Southern Asia, Ceylon Spinach is grown for its young shots and leaves wich makes a succulent vegetable. It can be used in green salads, fried in oil or boiled. Nutrient content is similar to other dark leafy vegetables with excellent micro nutrient properties. Ceylon spinach is a perennial vine that can grow 5-8 meters tall. It grows well on various soils, but prefer humus-rich well drained soils. It grows well in tropical lowlands with temperatures ranging from 20C° to 35C° and can stand high rainfalls and periods of drought. It has a remarkebly high resistance to deseases and pests. Red varities are popular as ornamental pot plants in Europe and North America but do not tolerate frost (Grubben, 2004).

Brassica juncea, Indian Mustard, Brown Mustard, Kadugu keerai
Leaf vegetable
Oil seed
The leaves of Indian Mustard is often reffered to as *"Mustard greens"* and are consumed cooked or raw as a leafy vegetable in asian cousine. Although its usage as a vegetable, *Brassica juncea* is mainly grown for the oil seeds, and produces one of the major edible oils in India (Purdue University, 1997). The seeds are also used as a spice in several Tamil dishes (First hand observation). The leaves are high in micro nutrients, especially in vitamin A, vitamin C and Iron, and it has been estimated that one cupful (140mg) provide an adult with 60 % of recommended daily intake of vitamin A, all the vitamin C needed and a fifth of daily iron requirements. Indian mustard is a perennial herb, often grown as an annual. It grows one meter tall and prefers sandy loamy soils, is relatively drought resistant and thrives in climates with hot day temperatures and cool nights. Growth is promoted by nitrogen availability and manure or cover crops are good additions. No crop rotation is needed. Indian mustard can also be a useful crop for cutting and mulching or as a covercrop. (Purdue University, 1997)

Colocasia esculenta var. *Eddoe,* Taro/Eddoe, Cheppankilangu
Tuber
Leaf vegetable
Colocasia esculenta is belived to have been domesticated in Northern India in very early times, probably even before rice. The white fleshed corm is cooked, fried or roasted and the leaves are used boiled. The stem and leaves contain an irritant substance that disapear when cooked (Grubben, 2004). The leaves are rich in micro nutrients and are sometimes used to enrich local dishes in Asia and

the Pacific with micro nutrients (Food and Agriculture Organisation of the United Nations, FAO). The *Eddoe* or *"Upland Taro"* produces smaller corms than the *Taro/ Dasheen* type but can be grown in dryer contitions with less input of fertilizers. It requiers good soil fertility and adequate organic matter and in India it is often seen cultivated on dykes of rice paddies. It tolerates shade and is therefore suitable for intercropping with coconut, banana or coffee. Taro is often used as an ornamental plant and is then reffered to as *"Elephant ears"* (Grubben, 2004).

Hibiscus cannabinus L. syn. *H. sabdarifa* subsp. *cannabinus* L, Kenaf, Pulicha keerai
Leaf vegetable
Shoots, young leaves and flowers are used as a vegetable, and Kenaf is also grown for its fibres. India has long been the biggest producer of Kenaf fibre. Nutrient properties correspond with other dark leaf vegetables with high concentrations of micronutrients, mainly vitamin A and iron. Kenaf is an annual herb that can reach hights of 2 meters in wild and upto 5 meters in cultivation. Ideal habitat conditions are well drained sandy loams with high humus content and day temperatures raging from 16- 27 C°. It does not tolerate water logging and respond well to organic manures. (Grubben, 2004)

Portulaca oleracea, Purslane, Pigweed, Paruppu keerai
Leaf vegetable
The succulent leaves and stems of Purslane have been used as a vegetable raw or cooked for a long time. The leaves have been reported to contain more Omega 3 fatty-acid than any other leaf vegetable (Beaulieu) and is also a rich source of vitamin A, C, B and caratenoids together with minerals such as magnesium, calcium and iron. It is also one of the most widely used medicinal plants in the world, with a wide range of suggested treatments. Purslane is a succulent annual herb with stems that can grow upto 50 cm long. It prefers a rich topsoil (Grubben, 2004). It is also being used as companion plant and ground cover, retaining humidity and stabilizing ground moisture. (Garden guides)

Rumex acetosa, Green sorrel, Garden sorrel, Chukkan keerai
Leaf vegetable
Green sorrel leaves are consumed as a leafy vegetable raw or cooked. It has an acidic taste that come from the oxalic acid in the leaves. It is high in caratenoids, vitamin A, vitamin C, magnesium and iron. One portion of leaves (200g) is reported to fullfill 30% of daily iron intake and more than 100% of daily vitamin A intake (Louis Bonduelle Fondation). Sorrels are common weeds with low soil requierements and can grow in most soils and conditions (Grubben, 2004).

Spinacia oleracea L, Spinach, Palak Keerai
Leaf vegetable

Leaves from Spinach are eaten raw or cooked. Leaves of most spinach vareties contain high amounts of oxalic acids, wich can lock up minerals, mainly calcium and make them unavailable to the body. The leaves however, also contains high concentrations of minerals, and disbenefits are to a great extent outweighed by these. Leaves are high in minerals like calcium, magnesium and iron, and also in vitamin A.
Spinach is an annual fast growing herb that reaches 30 cm. It grows on most soils that are not to acidic and preforms well in semi shade or full sun and prefer moist soils. In dry conditions the plant run its seed quickly and can for this reason be resown several times during the season (Plants For A Future).

Trigonella foenum-graeceum L, Fenugreek, Vendhaya keerai
Seeds
Leaf vegetable
Fenugreek seeds are eaten raw, cooked or sprouted but are most commonly used in different chutneys, curries and pickles. The seed is a good source of essential micro nutrients such as iron, phosphorus and sulphur. The leaves can be eaten raw or cooked. They are very aromatic and are added in small quantities as a spice or flavouring. The seed oil can be extracted and used for flavouring or for medicinal purposes. Fenugreek is an fast growing annual reaching around 0.6 meters. It is traditionally grown in semi-arid climates on the Indian sub-continent and grows well in most soils, dry or moist. It does not tolerate shade and grows best in full sun. Fenugreek is a member of the *Fabaceae* family and the species has a symbiotic relationship with certain bacteria that form root nodules and fixes nitrogen from the atmosphere (Plants For a Future).

Corcuma longa, Turmeric, Manjal
Rhizome
A yellow powder is axtracted from the rhizomes of the plant and used as a spice, dye or in religious cermonies. In the study setting the yellow powder is used in religious *pujas* for Lord Ganesha and during the religious annual festival *Pongal* as a offering to the sun God*, Surya* (First hand observation). The powder is said to have numerous medicinal purposes and studies have been done on its beneficial effects on cancer, Alzheimers disease and Diabetes (Wickenberg, Ingemansson, Hlebowicz, 2010). It is a perennial herb that grows up to 1 meter and is native to monsoon forests of South East Asia. It prefers loamy fertil soils in semi shade or sun and do not tolerate waterlogging. The plant produces a beautiful white flower that has a great ornamental value (Green harvest).
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Coriandrum sativum L, Coriander, Kottamalli
Seeds
Leaf vegetable/spice
Seeds and leaves are used to flavour salads and dishes. It is said to have medicinal properties and is locally mainly used for digestive purposes in addition

to its edible properties. Coriander is an annual herb growing to 0.5 meters. It prefers warm dry soils and grow well in partial shade or full sun (Sturtevant 1972, Plants For A Future).

Ipomoea batatas L, Sweet potato, Valli kijangu
Tuber/root
Leaf vegetable
Sweet potato is a sweet and fleshy staple food that is very rich in micro nutrients (USDA, 2011). The leaves can be used as a leafy vegetable and is reported to be a good source of calcium and iron, aswell as vitamin A (Self Nutrition Data). Sweet potato is a perennial climber that grows up to 3 meters. It is a easily grown plant in sunny locations with well-drained sandy loam soils (Plants For A Future).

Mentha x piperita vulgaris L, Peppermint, Pudina
Leaf vegetable
Peppermint and other mints in the area are used to flavour various foods and infusions and is said to have medicinal properties. The leaves are a rich source of minerals and vitamin A and the plant have antoxodant properties (USDA, 2011). Peppermint is a fast spreading perennial herb that grows well on most soils in semi shade and sunny conditions and prefers a moist soil (Plants For A Future). The area of the garden plan where peppermint is suggested could also be planted with other mints from the *Lamiaceae* or *Labiatae* families, depending on what species are available.

Musa acuminata (AAA Group) 'Red Dacca', Red banana, Sevvazhai
The red banana fruit is eaten raw or cooked and is rich in vitamin C, vitamin B6, potassium and manganese (Self Nutrition Data). The banana is a herbaceous plant often confused with a tree, growing up to 5 meters. Banana grows best in deep, fertile, well drained soils with high organic matter. It also benefits from mulching, especially in lighter soils (Queensland Government Department of Agriculture, Fisheries and Forestry).

6.2.5 Fertilizers and soil structure improvement

mproving the soil structure, adding organic matter providing nutrient buffering and water retention can have several positive impacts. Prior to the ”Green Revolution”, physical, chemical and biological soil properties was not a major issue in India, but heavy use of NPK fertilizers, precision farming and fertigation has lead to a 30-40% decrease in organic matter and soil health. Balanced nutrition has become an issue and micronutrient supply precarious (Edward Raja, 2009). In addition to providing micro nutrients to the final consumer through the edible part of the plant, the availability of micro nutrients in the soil can also boost horticultural crop yield and improve the products shelf life and quality significally. Further, plant available micronutrients can:

- Improve the quality, taste and size, enhancing the market appeal
- Provide disease resistance and reducing the need for pesticides
- Enhance nutritional security

The adding of organic matter to make local nutrients available has often been over seen (Edward Raja, 2009).
In the kitchen garden, the adding of locally available resources of organic matter will be suggested through mulching, adding of compost and animal manures regulary. Mulch materials in form of leaves, husks and straw are widely available in the area but often descarted or burnt. In mulching practices a layer of organic matter is distributed on top of the soil. Mulch will insulate the soil from rapid temperature changes, increase water perculation rates, while retaining water in the organic matter and provide a good habitat for pest eating creatures such as beetles and centerpedes (Pears, 2001). In addation to these benefits the mulch will act as surface compost, slowly releasing nutrients by microbal decoposition.
Results show that mulching practices are rarely or never applied by the few gardeners in the local community. Information gathered through interviews and verbal communication with women from interest group B clearly states that the reason has to do with lack of knowledge. A certain skepsis can also be detected; possible mulching materials are regarded as trash or something to get rid of rather than a valuble reasource. For eastetic reasons most women were not very keen on putting “trash” in their vegetable beds (Interest group B). In contrast to the non-existing mulch practices in the local community, Bernard Declerc (Intrest group C) is a heavy promoter of mulching practices and built up all of his productive 7 acres vegetable cultivation using mulching practices including leaves and other dead organic matter, and for him this has been a crucial part of his success (Bernard Declerc, interest group C). Demonstrating how mulch practices can be a part of an aestetic garden setting is therefore of great intrest to the kitchen garden design plan. At the site a vermicompost have already been constructed, it is used and promoted by CIRHEP and can provide nutritious rich compost in intervals of approximately 30 days (personal contact, P.M Mohan, 2013). Vermicomposting is a composting practice using highly effective decomposition worm species and have been promoted to local farmers by CIRHEP, but could be a valuble resource of soil improvement material to smaller scale kitchen gardens like wise. The worms can be distributed to the local community by CIRHEP.
With a lot of families engaged in small scale animal husbandry in the area, animal manures from cows, chickens, goats and sheep are available. Animal manure is a good soil structure builder aswell as a traditional source of soil fertility, with especially high rates of nitrogen and potassium (Pears, 2001). Organic fertilizers are being used locally to some extent in agricultural practices, but results from interviews show that manure is rarely applied to the local kitchen gardens. Indications from the focus group interviews seems to be that manures are regarded as a resource too valuble to be spent on small scale gardens. Most of the people engaged with animal husbandry and have direct access to organic manures are also landowners engaged with agriculture, and the manure is rather used as a soil improver on commercialy grown agriculture land than for homesteading purposes. This could state a problem for kitchen garden growers. Cow manure is by many considred the most valuble form of organic

fertilizers and the demand from farmers is high. Manure from chickens and poultry are rarely used in agriculture practices. This is probably due to the complexity of gathering manure in greater volumes as the chickens mostly seem to live in smaller free roaming groups wich do not produce the quantity of manure needed for larger agricultural fields (First hand observation). The chickens tend to spend the nights on one selected spot and during the study I observed a group of chickens spending every night in the same hibiscus shrub. Manure gathred under the hibiscus could easily be collected and applied in a smaller garden. Fresh chicken manure can contain human pathogenesis and stressing the importance of composting practices should therefore also be discussed with the targeted interest groups. Composting the manure 3-4 weeks before application will not only deminsh the risks of human contaminants, but also enhace the nutrient properties of the manure and reduce nitrogen leakage (The poultry guide 2013).

6.4 Proposed elements of kitchen garden

The proposed elements of the kitchen garden have different pedagogic values that the study have shown could be of intrest communicating to the targeted intrest groups. The different themes of the design elements are based on results from the interviews and observations regarding local gardening practices. The elements chosen mainly highlights techniques for productive gardening on small spaces, as space is the most limiting factor for landless women without acsess to farmland. The different elements should if possible be explained on site by someone with insight knowledge about the different techniques, plants and nutritional values. Positions of the elements can be seen in the garden plan, Appedix 2.

6.4.1 Legume and bean portal

Entering the kitchen garden from north, the visitor will have to pass through a portal of climbing beans and legumes. The portal have several functions. It is serving as a threshold between the room outside and the garden, (Dee 2001) clearly defining the different rooms. The portal also demonstrates a creative and space-saving method to grow climbers. From observations in the study setting it is clear that growing beans and legumes on trellies is nothing new to the targeted focus group, but as seen in figure 6.2, using very low trellies the space under is rarley used. This portal show how you can raise the roof of

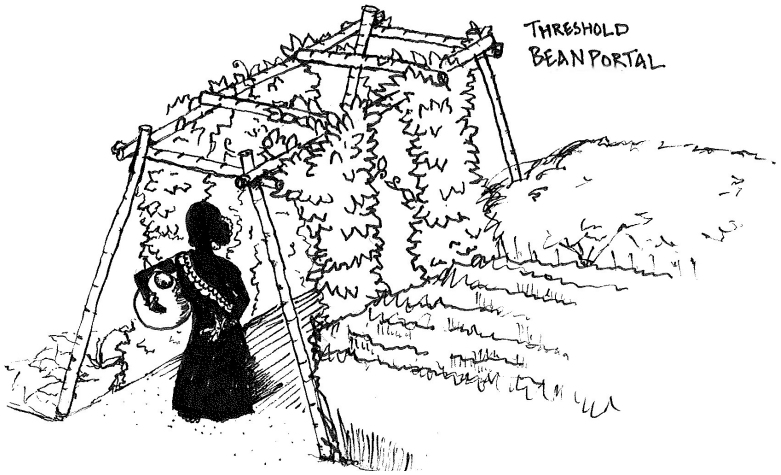

Figure 6 1 Sketch of bean portal in north entrance of the garden (Hillve, 2013).

the plant supporter, enabling passage and interaction under the trellie roof, saving both space and act as a passage. The method can be used on very small spaces as it takes advantage of vertical space wich is abundant in all spaces without roofing. Species that could be used and are available in the area include:

- *Pisum sativum,* Pea, Pattaani
- *Cyamopsis tetragonulobus,* Cluster beans, Kothavarangai
- *Phaseolus vulgaris,* French beans, Beans

Figure 6. 2 Local bean trellie. Note the low (approx. 120 cm) height (Hillve, 2013) .

6.4.2 Stacking

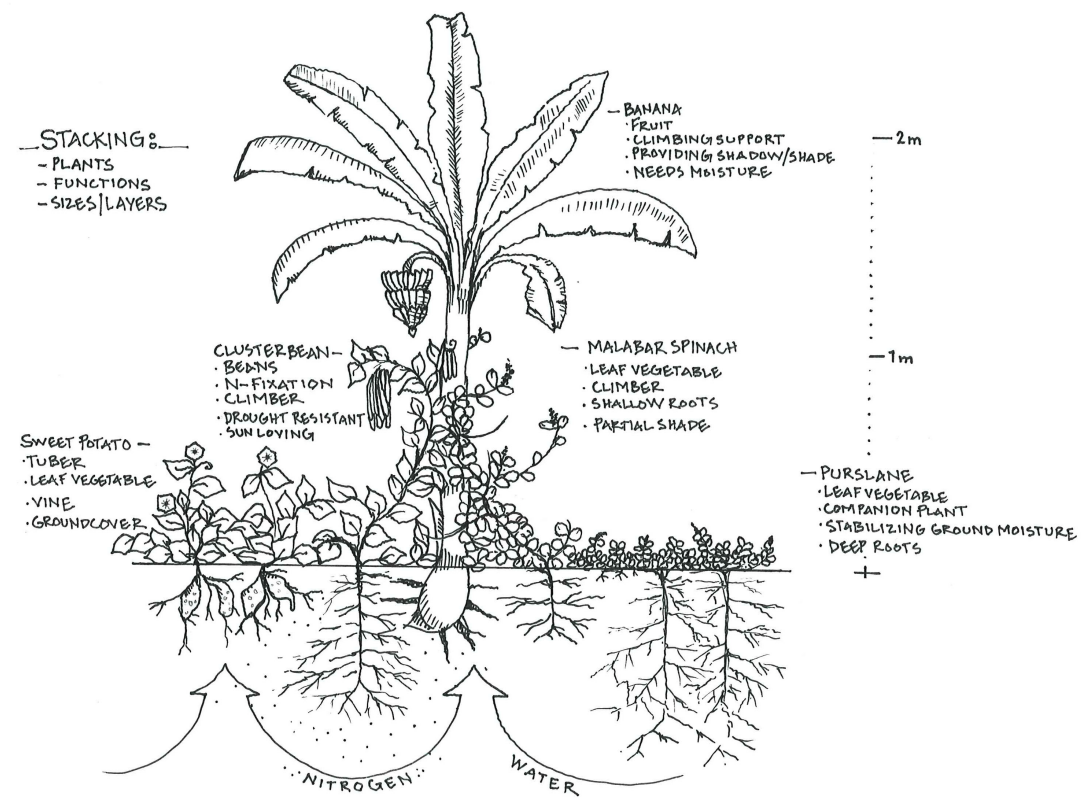

Figure 6.3 Stacking of plants can allow dense plantations and multi-layered yield (Hillve, 2013).

Stacking is a method of growing plants of different heights, shade tolerances, water need and growing habits and ”stack” the plants together in an elaborate way to save space, often promoted in permaculture (Mollison, 1991). With this element I want to show how you can combine a number of plants on a very small area by knowing the plants habitual growth and take advantage of their different characteristics. The banana will function as a plant supporter for climbing Malabar spinach, Beans and Sweet potato, while providing shade and creating an sheltered environment. Beans are nitrogen fixers and can enrich the soil with nitrogen, (Bliss, 1993) making nitrogen available to the banana. The Malabar spinach, Purslane, and the Sweet potato, will cover the ground, creating a humid micro-climate for the rhizosphere of the plants and the micro organisms in the top soil. This will also demonstrate how you can achive multi-layered yield in a dense plantation, providing produce from the root zone; (Sweet potato), ground level (purslane and sweet potato), intermediate hight (Beans and Malabar leaves) and the canopy layer (Banana). The planting will also function as a Foci (Dee, 2001), visual from different viewpoints and emphasizing the center of the garden.

6.4.3 Raised vegetable beds

Three raised vegetable beds are planned in the garden. The main function of these are as examples of how the soil structure and fertility can be enhanced by mulching the top soil. The mulched beds are also an example of a water conservation technique, rataining water and reduce vaporation rates (Pears, 2001, Mollison, 1991). Observations of local gardening practises clearly showed that mulching techinques are rarely applied and most vegetable cultivation is done with bare soil exposed to the scorging sun. Demonstrating a technique for a more water sensible and economic approach is therefore of great concern in a setting where water access is limited. Cultivation in raised beds also have the advantage of not being as dependent on soil structure as direct planting in the ground, and can be promoted on areas where heavy compaction or poor soils make other cultivation impossible. Bamboo and palmkeet kan be used to line the raised beds. Plants for these beds are not specified but left for the gardeners to choose. The beds are suitable for the cultivation of various annual vegetable crops. Following vegetables are widley grown and consumed in the study setting and could be planted in the raised beds (Names are given in English, Latin and Tamil):

- Gourds*, Cucurbitaceae* family, Kaiy
- Brinjal/eggplant*, Solanum melongena*, Pavara kaiy
- Tomato*, Solanum lycopersicum*, Takkali
- Chilli peppers, *Capsicum* family, Milagaiy vatral
- Capsicum peppers*, Capsicum* family, Kudaiy milagaiy
- Ladies finger*, Abelmoschus esculentus*, Venda kaiy
- Beetroot, *Beta vulgaris*, Beetroot kijangu
- Onion*, Allium cepa*, vengaiyam

- Carrots, *Daucus carota*, carrot
- Cabbage, *Brassica oleracea* or variants, Mutha koss

(First hand observations, focus group B, focus group C)

Crop rotation practises should be applied and communicated further to the target groups, breaking weed and disease cycles, maintaining long term soil fertility and reducing the dependence on external inputs (Gebremedhin, Schwab, 1998).

6.4.4 Pot garden

The pot garden is a serie of containers acting as an edge between garden space and the the recreational area (Dee 2001). Containers used as planters can be copper pots or traditional pottery widely available through out the study setting. The reuse of pots not fit for their original purpose could be considered, as these often end up descarded laying around in the villages. Traditional pots are often beautifully handicrafted, painted or engraved with iconic elements of regional art and patterns (Cultural India). Planted with herbs, medicinal- or ornamental flowers like *Chrysanthemum, Gerbera, Gladiolus. Barleria* or *Marigolds,* the pots would add an aestetic value, provide cuttings and/or fresh produce and provide nectar and pollen to beneficial insects enchancing a balance between pests and natural enemies (Pears, 2001).

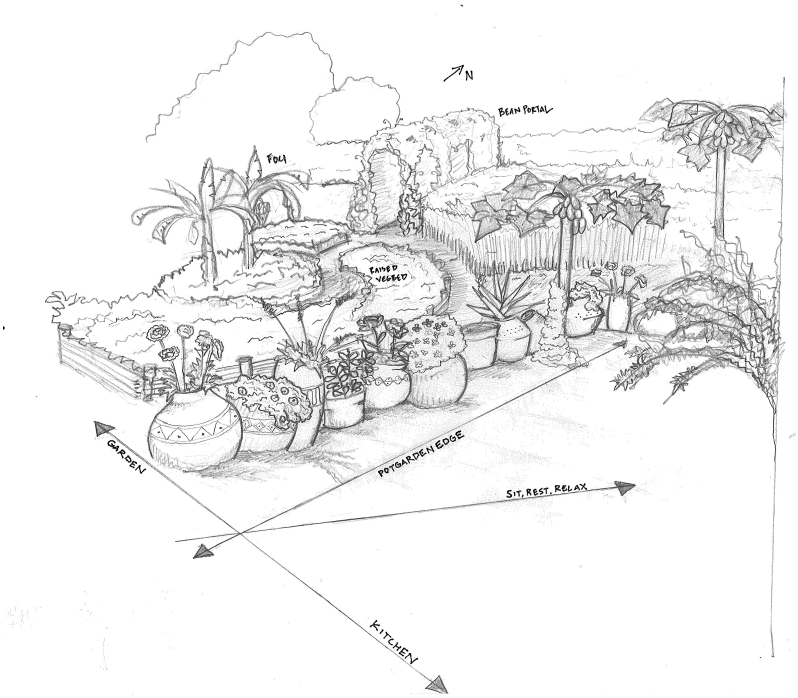

Figure 6.4 Potgarden as seen from South East (Hillve, 2013)

Figure 6. 5 Descarted pots in the village of Veelanayakanpatti (Hillve, 2013).

6.4.5 Recreational area

A small recreational area is planned in the South East corner of the garden. Shaded by trees and the kitchen, this area will give the oppurtunity to relax in a beautiful setting and is planned to give some room for privacy, a seldom available luxury in densly populated India. Living and working on the grounds for two months it was clear that a recreational area in the outdoors, protected from the sun could raise the quality of life for people active on the centre. The recreational area can be used by care takers of the garden, employees at CIRHEP or visitors such as international volunteer workers or guests enrolled in different courses atthe training centre.

6.4.6 Tool shed

A tool shed should be built in close proximity to the garden to facilitate work. It should be placed where access is easy, but out of sight from the garden to not disturb the setting.

7. Discussion and conclusions

Hidden hunger is a complex problem and one simple solution do not exist. Although gardenening have been recognized as a viable tool to combat micro nutrient deficiencies, (Chakravarty, 2000, Helen Keller international, Burchi, Fanzo, Frison, 2011) more research is needed to evaluate the actual impact and effects of such programs and projects already launched. The promotion of gardening as a mean to battle hidden hunger have something other efforts lack; Supplementation, food fortification and biofortification strategies are all based on the dependency on external sources to reduce malnutrition, while as gardeing can be done independently, cutting the navel chord to external forces and by creating selfgenerating cultivation systems it strengthens local food security. For this reason I find gardening a viable tool that should be encouraged. The positive inpact this garden design could have to the local community in the study setting is very much dependent on local initiative. The garden itself have no educational value if there is no one to manage it properly and to communicate the ’message’ further to local target groups. The garden should be considered a part of a greater context rather than an isolated educational feature and efforts must be put into finding a suitable framework for such a concept. To make this happend, economic resources must be invested to run the gardening concept and provide an income to one or more persons in charge of the project. This must be a Tamil speaking person with local knowledge and insight in cultural patterns who have a certain social position in the community and can be trusted by the women. For this reason, positive impacts of the kitchen garden is very much in the hands of CIRHEP or other local initiatives who are the ones with the economic strenght to run such a project. Further education regarding both nutritional diets and gardening must be provided to local NGO employees engaged with the project aswell as the local community in general to spur the motivation and increase

knowledge. The targeted intrest group I have chosen are women, but addressing the men should also be thought of. They might not be the ones tending the kitchen gardens in the end, but helping them grasp the problem and understand the benefits of gardening could spur development further. Next step is to spread the concept, make people adapt it and actually start implementing the concept through their own gardens at a grassroot level. With the right efforts by local actors, this garden could function as an educational “hub” for gardeners in the area area. It could also have a practical role as local seed- or/and plantbank, and seeds and seedlings could be distributed to active gardeners or interested beginners in the local community once the concept have started to take root.

As a landscaper my role has been to evaluate the physical planning aspects regarding the possibilities of implementing a kitchen garden and this is also where my competence ends and continued work from several diciplines such as the health care sector and educational sectors is needed to form a holistic framework to successfully tackle hidden hunger.

To create a more complete picture of the problem and possible solutions in future projects, a greater number of informants and interviews can be addressed to create a more solid basis for continued work. Time limit, language- and cultural differences made this difficult during my stay in the area. A quantitative approach to evalute food consumption habits and economic patterns could be a viable tool to further understand the needs and possible obstructions associated to hidden hunger prevention. A vast portion of information gathering of the study is based on personal contact with locally active people. Sometimes this information has been hard to back up with academic litterature and this should be considered by the reader. Gardening techniques and plant selection used in the garden can be be discussed or complimented. Specific information regarding plant spacing, depth, pests and crop rotation practices should be evaluated further to ensure good productivity and reduce pest related issues. The proposed plants are a mix of perennials andannuals. The annuals proposed are in most cases fast spreading by seeds or rhizomes and the plantations containing a mix of annuals and perennials should be regarded as dynamic rather than static and some successional changes in positions and distribution should be accepted but monitored to ensure that no single species are allowed to take over or disappear. Through observation future managers can evaluate how the different plants correlate with each other and the place and develop strategies to optimize the result.

Nutritional facts regarding plants derrive from databases available online. There are a number of these available on the internet and the relevance of the data is sometimes doubtfull. Some websites providing information on nutritional properties of food stuffs do not state any references or sources, and the information provided by these websites should be dealt with from a critical point of view from future researchers. For this reason I tried to use objective databases wih a strictly scientific approach and most of the nutritional facts are extracted from USDA (United States Department of Agriculture). In some cases the ”Self Nutrition database” is used as a reference, providing both data from USDA and supplementing information from restaurants and food manifacturers (Self nutrition Data). A possible task for future researchers is to quantify how much space and the number of plants that are required to fulfill daily recommended intake of different micronutrients. Research on different rain water collection and storage techniques suitable to the setting is a field worthy of more attention.

Devices to collect and store rainwater from roofs could be integrated in gardens, but aspects regarding how much water that could be collected during the monsoons, how the devices can be designed to withstand the pressure from great water volumes and possible risks involved in storing water such as the unattentional creation of breeding places for mosquitoes and pathogens must be evaluated.
Design plans can always be discussed and complimented and this plan should not be considered as the only possible solution, but rather an subjective expression based on available circumstances and resources. Rather than being considred The Solution to micro nutrient dificiencies, I hope the garden can inspire further work and be a part of an holistic approach to decrease hidden hunger related issues and promote long term sustainable livelihood options and increased health in rural Tamil Nadu, India.

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9. Unpublished sources

A. Sathiya Seela Employee, Center for Improved Rural Health and Environmental Protection (CIRHEP) Nilakottai

Focus groups A,B,C

K.A Chandra, CIRHEP 2013-02-29

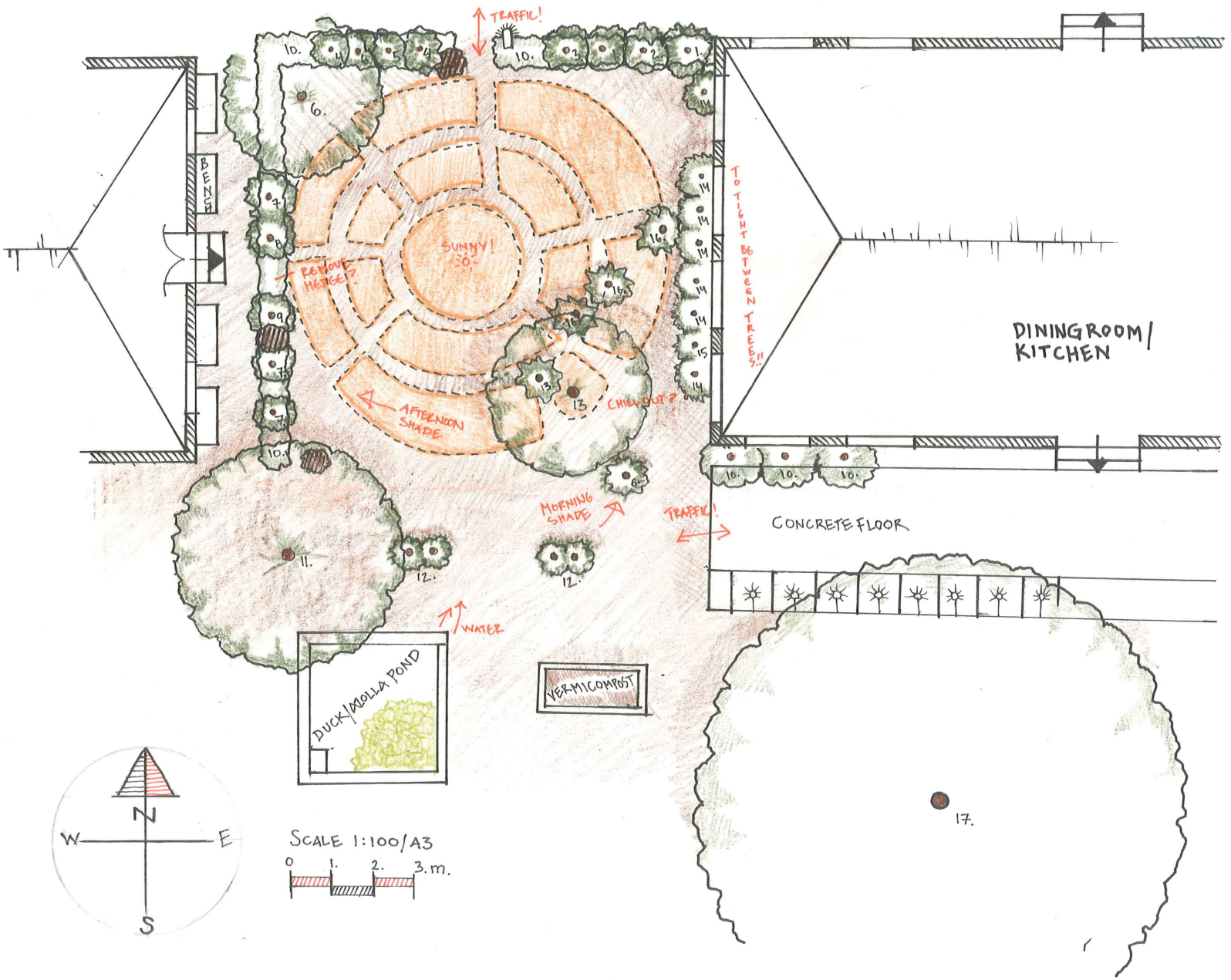
Mahalakshmi, supervisor and social worker, Integrated child development scheme, Social well fare department, Nilakottai

P.M Mohan, CIRHEP 2013-03-10

Actual Site Map (March 2013)

Kitchen Garden Area

Training Center, C.I.R.H.E.P



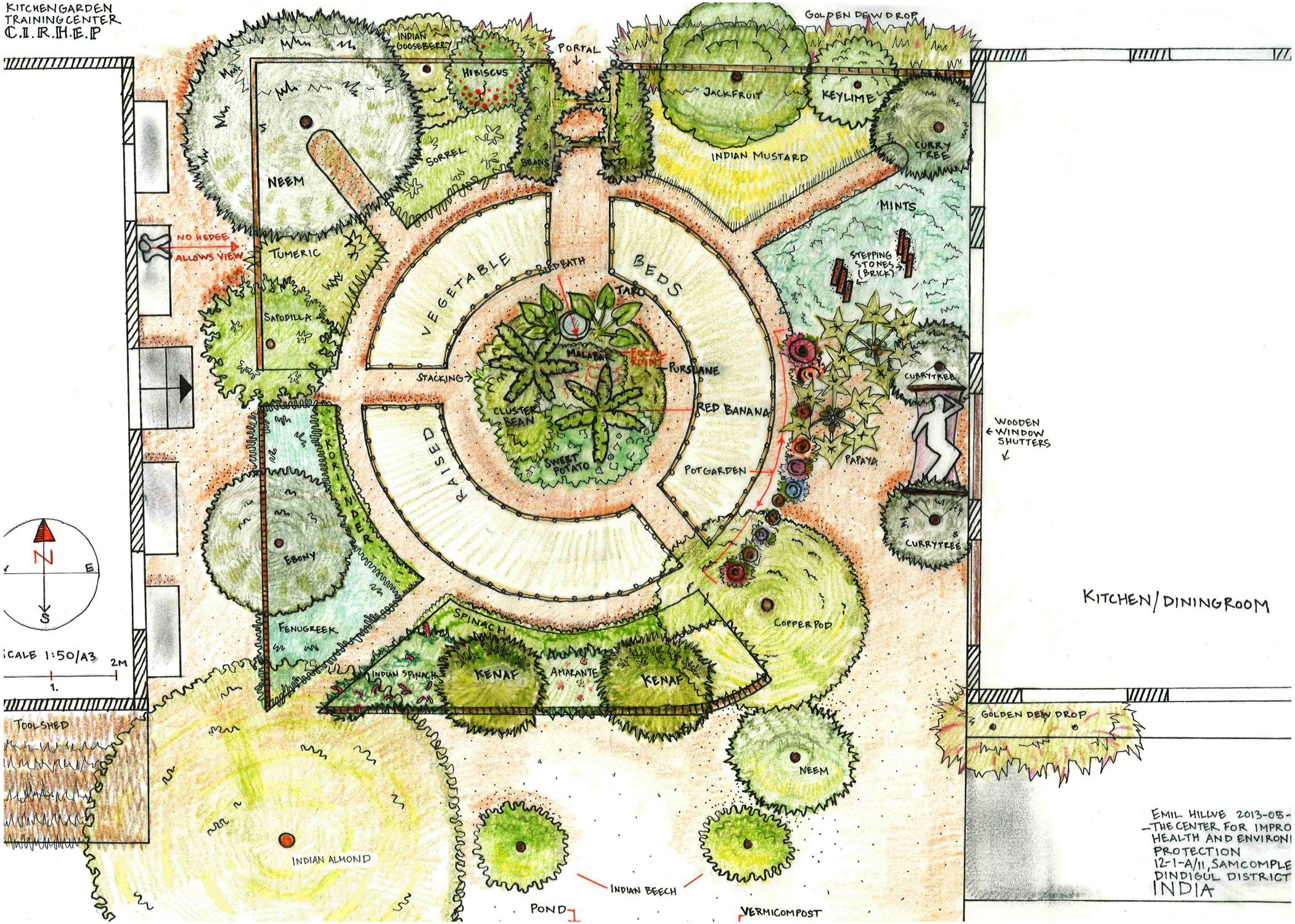
List of Plants:

1. Bastard Myrobalan - Terminalia bellerica
2. Keylime - Citrus aurantifolia
3. Jackfruit tree - Artocarpus heterophy
4. Hibiscus - Hibiscus rosa-sinensis
5. Amla/Indian Gooseberry - Phyllanthus em
6. Neem tree - Azadirachta indica
7. Ebony - Diospyros ebenum
8. Sapodilla tree - Manilkara zapota
9. West Indies Mahogany - Swietenia mahog
10. Golden dew drop - Duranta plumieri
11. Indian almond - Terminalia cattapa
12. Indian Beech - Pongamia pinnata
13. Copper pod - Peltophorum ferugianum
14. Curry tree - Murraya koengii
15. Annona/Sugarapple - Annona squamo
16. Papaya - Carica papaya
17. Banyan tree - Ficus bengalensis

Legend

- o - Tree/shrub
- Stair
- Door
- Lantern
- Zink + tap
- Dead tree
- Existing vegbed structure

Emil Hillve 2013-03-25
The Center for Improved Health and Environmental Protection
12-1-A/11., SAM Complex
Dindigul District
Tamil Nadu
India


KITCHEN GARDEN
TRAINING CENTER
C.I.R.H.E.P
INDIAN GOOSEBERRY
HIBISCUS
PORTAL
GOLDEN DEW DROP
JACKFRUIT
KEYLIME
CURRY TREE
INDIAN MUSTARD
SORREL
BEANS
NEEM
MINTS
NO HEDGE
ALLOWS VIEW
TUMERIC
STEPPING STONES (BRICK)
VEGETABLE BEDS
BIRDBATH
TARO
SAPODILLA
MALABAR
FOCAL POINT
PURSLANE
STACKING
CURRYTREE
CLUSTER BEAN
RED BANANA
SWEET POTATO
RAISED
WOODEN WINDOW SHUTTERS
PAPAYA
POTGARDEN
CORIANDER
EBONY
CURRYTREE
KITCHEN/DININGROOM
COPPER POD
SPINACH
FENUGREEK
INDIAN SPINACH
KENAF
AMARANTE
KENAF
SCALE 1:50/A3
2M
1.
TOOLSHED
GOLDEN DEW DROP
NEEM
INDIAN ALMOND
INDIAN BEECH
POND
VERMICOMPOST
EMIL HILLVE 2013-05-
-THE CENTER FOR IMPRO
HEALTH AND ENVIRONI
PROTECTION
12-1-A/11, SAMCOMPLE
DINDIGUL DISTRICT
INDIA

Appendix 3.

Interview questions Interest group A

Date:
Name:
Total land area: (m2)

Which vegetables do you eat several times a week/daily?

From where do they come? The market, other farmers etc?

Are there any vegetables you would like eat more often but for some reason you can't?

Do you grow any food crops?

Why these?

For what purpose? Home use or market?

What is your source of income?

Do you have any animals?

If someone with local knowledge would support you arranging a small kitchengarden, provide seeds, knowledge etc. Would you be intrested?

What would you like to grow?

How much time/day would you be able to manage the garden?

Do you have anything else to add?

Appendix 4.

Interview guide interest group B

Date:
Name of family:
Total land space (m2):
Kitchen garden space (m2):

Why do you grow a kitchen garden?

What do you grow in your kitchen garden?

Why these?

If you did not have a kitchen garden, would you afford buying what you are now growing?

How much money do you spend weekly buying food?

On what food do you spend most money?

How much would you spend without your kitchen garden?

How many days a week average do you eat produce from your kitchen garden?

How many are you in your family?

Do you consider your kitchen garden to of economical value for your family?

Wich family member is tending the kitchen garden?

How many hours a week do you spend tending to your kitchen garden?

From where did you get the seeds/plants?

What fertilizer (chemical or biological) do you use and where does it come from?

What problems do you encounter in your kitchengarden?
-Pestrelated
-water shortage
-time consuming
-labor intensive
-poor plantgrowth

Do you have pest problems?

Are you using any pesticides?
If yes: what pesticide, where does it come from, how much does it cost?
If no: Would you like to? What would you like to use?

How often/much do you water your kitchen garden?

Would you like to water it more if water resources were plenty?

Anything more you would like to add or tell me?

Appendix 5.

Interview guide Social worker (Complementary interview)

Date: 2013-03-10
Name: G. Mahalakshmi
Proffesional title: Superviser grade 1 (officer) Integrated child development scheme "Social welfare department" Nilakottai

What do you do? Please tell me a little about your work..

For how long have you had this profession?

I am intrested in health among the rural people in the region. What kind of health issues are common here?

Do you know if any of these issues are caused by malnutrition?

Why does malnutrition exist do you think?

Do people know about malnutrition?

What mesures have been taken to create awareness regarding a healthy diet among village communities and do you know how they have responded?

Do you know if there is any other measures taken? (Distribution of nutrient fortified food etc)

Have you seen any changes in peoples food habits during your time?

Have you noticed any diffrences in peoples health status during your time?

If yes: why do you think?

Anything else you would like to add?

Appendix 6.

Interview guide employee CIRHEP (complimentary interview)

Date: 2013-03-10
Name: A. Sathiya Seela
Profession: CIRHEP

How are different responsabilites distributed within a tipical family here?

Which are the mens responsabilities/duties and which are the women's?

The children?

Who is normaly in charge of household economics?

How is the sense of community? Does people help each other out with different chores? (babysitting, firewood gathering, water and cloathes washing etc)

How is the local community organised? Do you have different clubs/groups within the village? (women groups, farmers clubs etc)

How is decision making affecting the whole community/village managed?

Would you say that people in general are open to adopting and trying new ideas coming from outside the community if they can understand that it would be beneficial to them?

Does people value other benefits than economic benefits, for example improved health?

If someone with local knowledge helped starting up a few kitchen gardens to improve diets, would there be an interest?

Would people invest time, energy and money in such projects?

What would it take to motivate the hosts of these gardens continue maintaining the garden on a long term perspective?

Anything else you would like to add?