

Hygiene and Sanitation Assessment Report for Kurunegala, Sri Lanka

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This report is one in a series of project reports written by the Wastewater Agriculture and Sanitation for Poverty Alleviation in Asia (WASPA Asia) project. The WASPA Asia project aims to develop and test solutions for sanitation and wastewater management, to reduce the risks from wastewater use in agriculture. The approach involves the development of stakeholder coalitions at town and national level, called Learning Alliances, which will bring together the main stakeholders into a participatory process through which actions will be planned and implemented in a sustainable manner.

These project reports are essentially internal documents intended to inform the future activities of the project, particularly in relation to the development of Learning Alliances and participatory action plans. The reports have been made publicly available as some of the information and findings presented in them may be of use to other researchers, practitioners or government officials.

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Acronyms and Abbreviations

DF	Dengue Fever
DHF	Dengue Hemorrhagic Fever
FGD	Focus Group Discussion
GN	Grama Niladhari
PHI	Public Health Inspector
MC	Municipal Council
MoH	Medical Officer of Health
NWSDB	National Water Supply and Drainage Board
WASPA	Wastewater Agriculture and Sanitation for Poverty Alleviation

1 Introduction and Objectives

This assessment was undertaken as part of the Wastewater Agriculture and Sanitation for Poverty Alleviation in Asia (WASPA Asia) project, which aims to improve the livelihoods of peri-urban and urban farmers who are using wastewater. Identifying key stakeholders and building learning alliances among them is at the centre of the project focus. Thus, the overall project objectives outline a series of assessments, along the wastewater generation to user pathway, including the consumers of such produce. The hygiene behavior and sanitation assessment undertaken here is one of them.

It is intended that the information gathered in this study will be combined with findings in other linked studies on water quality, industrial pollution, agriculture and institutional issues. Together these findings will be used directly in planning interventions with the community members. The studies were therefore not extensive but were targeted specifically to this purpose. They will also be followed up by discussions with community members and other stakeholders to check the findings and recommendations made. These meetings will be used to plan intervention activities with stakeholders.

The stakeholders discussed here are predominantly farmers who use the wastewater and low-income communities who produce some of the wastewater, and who are faced with inadequate facilities for sanitation and wastewater disposal. They were identified at the outset of the project in a stakeholder analysis conducted by the team. The analysis identified various stakeholder groups involved in wastewater production, management, regulation and use¹. Where necessary, further studies have been undertaken to improve understanding of the issues faced by these stakeholders and their contributions to the system. These include an assessment of the potential pollution from industries and commercial units, as well as a review of the relevant policies and institutions.

The objectives of the sanitation study were to assess the sanitation and hygiene behavior of:

1. Farmers that use wastewater for irrigation; and
2. The low-income communities that live along the canals who might be key polluters, due to their lack of access to facilities to effectively contain or treat waste (the commercial polluters have been identified in another assessment study).

¹ The results of the stakeholder analysis can be found in Varma and Gunawardana 2007.

2 Study Area

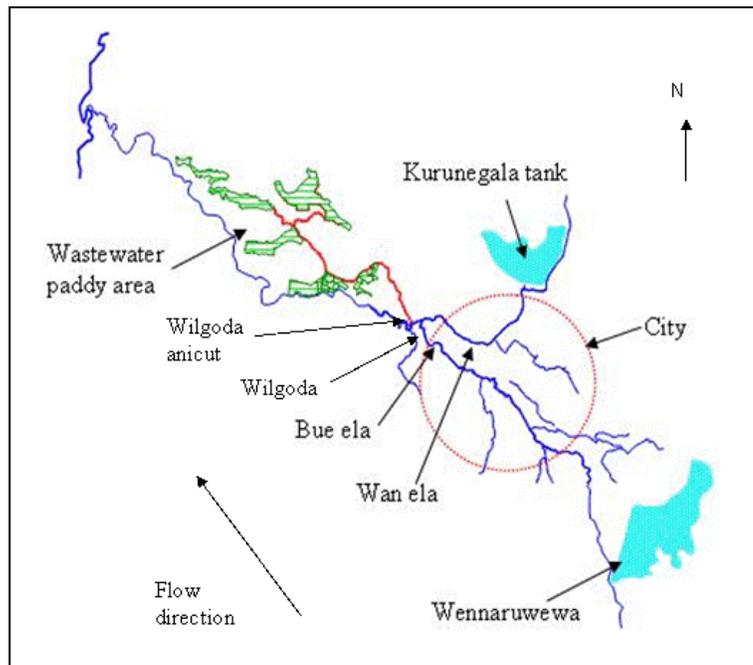
Location

The project area encompasses the Municipality of Kurunegala and part of the agricultural area to the north-west of the city, which includes four Grama Niladhari (GN) Divisions: Aswedduma, Dematagahapelassa, Kaudawatta and Wilgoda (Nishanka et al. 2006). The extent of wastewater agriculture in this area has been calculated using RS-GIS to be approximately 54 ha (Jayakody et al. 2007).

Within this area is an ancient irrigation canal system that now runs through the town and irrigates a vast area down stream (see Nishanka et al. 2006; Jayakody et al. 2007). Two of the canals in this system, the Wan Ela and Beu Ela have been lined and are now used for storm-water drainage, but they combine just above Wilgoda Anicut and flow on to agricultural land. This irrigation and drainage water is often polluted with other wastewater including domestic and commercial waste.

Figure 2.1 shows the location of Wilgoda and the agricultural area in relation to the canal and the city. In the continuum of the wastewater generation and user pathway, the farmers are at the tail end and the Wilgoda community is positioned just at the periphery of the city boundary about 1.5 km before the farmer community, with the irrigation canal system running along side some of the dwellings (Figure 2.1).

Figure 2.1: Schematic of the irrigation canals and research area



Stakeholders

The key stakeholders for the project were identified in a stakeholder analysis that was carried out at the beginning of the study. The key questions that were asked were: “who is using wastewater?”; “who is affected by the wastewater?”; “who is creating the wastewater?”; “who regulates or manages wastewater production?”; and “who can bring about sustainable changes if required?”. This study deals with two of the stakeholder groups: farmers that use wastewater for their crops and a low-income community whose infrastructure facilities are inadequate and as a consequence are contributing to the wastewater in the canals. Other wastewater producers, principally commercial units, were considered in a separate study under the WASPA Asia project.

The farmers are resident in three GN divisions: Aswedduma, Dematagahapellesa, Kaudawatta with a total population of 3342 and 803 households. The total number of farmers using wastewater was found to be 137, who cultivated a total of 53.4 ha of paddy in five areas (Table 2.1; Jayakody et al. 2007).

Table 2.1: Farmers involved in wastewater farming

Paddy area name	Number of farmers	Extent (ha)
Nelligahapitiya	15	13.7
Illukpitiya	30	9.0
Kahatagaha	32	8.3
Galeyaya	13	5.2
Pallepotta	47	17.1
Total	137	53.4

The low-income community living in Wilgoda Pura is the housing scheme for the Municipal Council (MC) laborers and covers approximately 5 acres. It is located in the GN division of Illuppugedara, near the cross of Wan Ela and Wilgoda main road (from Puwakgas Junction - “Dakunu Ravum Para”), and distributed on both sides of the main road. Although the land and houses belong to the Kurunegala MC, several informal dwellings have been established in and around the line houses over the years and the population of the settlement has increased. At present, there are 119 houses² including informal dwellings (Annex I), which house a total of 587 individuals including 407 adults (Nishanka, de Silva and Clemett 2006).

Although most of the residents of Wilgoda Pura are MC employees, a survey in 2006 showed that many have supplementary jobs and have average monthly earnings of around Rs12500. As most families were single family households (80%) this income was often the main income of the household. In some cases, there were older children and multiple families living under one roof, usually as a result of married children staying with their parents; in these instances household incomes were higher. The number of individuals living in a single household ranged from 1 to 16, with five member households being most common (24%) (Nishshanka et al. 2006).

² This has increased from 114 in the 2006 survey (Nishanka et al. 2006).

Sampling Methodology

A number of different tools were used to assess the overall sanitation and hygiene behavior of the study groups. A guidance note was used to plan the field work, which included: transect walks, questionnaire surveys, focus group discussions (FGDs), one-to-one discussions and collection of government health data. While many options were considered, the best approach was decided upon by the experience of the interviewers and community leaders. Several worksheets were used to collect the relevant information whether through interview or observation.

A basic household survey was used to collect general infrastructure and the demographic information of Wilgoda (see Nishanka, de Silva and Clemett 2006) and FGDs were undertaken to understand the situation in the agriculture area in 2006. These were followed in 2007 by transect walks, including an observations check list, in both areas, which covered public places, common toilets, bathing place, and areas along the canal. A limited household survey was conducted with 10 households in Wilgoda and 15 farming households. The project team was also provided with data collected by Practical Action, an international NGO working in the area on an environmental management project. This included a community map and data on the health of children, collected during a health clinic that they organized.

The major areas of assessment were as follows:

- The sanitation facilities in the area (including number of sanitation facilities in relation to the population, quality of the facilities, status of maintenance, what happens with the waste, smells and wastewater flows);
- Access to the facilities for different groups in the community (such as men, women, children, poor and better off);
- The use patterns of different groups in the community over time (including use during different seasons, and the sustainability in use of toilets, presence of open defecation, and reasons for use such as convenience and comfort);
- The hygiene practices of groups in the community and the enabling factors for hygiene (for example, boots for wastewater farmers, availability and use of soap, and clean water for hand washing); and
- The health status of community members, particularly for water-related health risks and health status.

Secondary health data were obtained from the epidemiology unit of the Provincial Health Department (PHD), the malaria control unit and the filaria control unit in Kurunegala. The data was used to identify the major health risks due to stagnation of wastewater in the canals and *anicut*.

3 Results and Discussion – Wastewater Farmers

Infrastructure, Services and the Environment

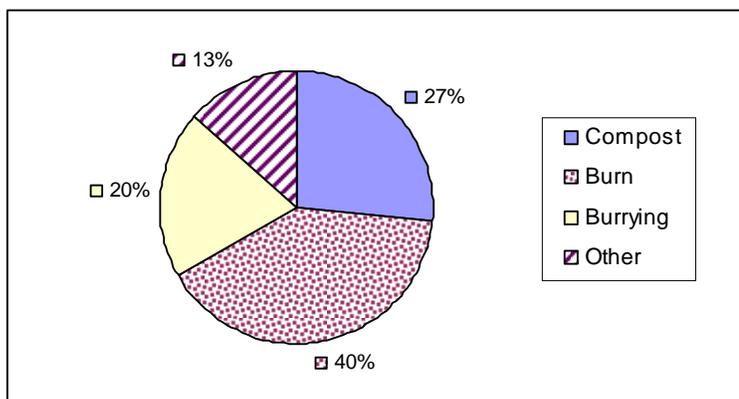
The household survey revealed that most of the farmers' houses are constructed with bricks and cement and have tiled or asbestos roofs. There is no area in the village that is predominantly occupied by farmers. Homesteads in the area tend to be separated by around 25 m, which results in an apparently clean and pleasant environment. Overall cleanliness inside the houses appeared to be good too.

Since the three GN Divisions were outside the MC area they are not supplied by a central piped water system, therefore most people use shallow ground water wells, some of which are not protected with surface level side walls. This water is used for drinking, cooking, washing and bathing. A few households have motor pumps that enable them to have pipe-borne water, but the majority carries their daily supplies from the well to the house for different needs. Bathing and clothes washing are mostly done at the site of the well.

Most of the farmers who were interviewed have electricity connections, but they have to pay the Ceylon Electricity Board for their separate connections.

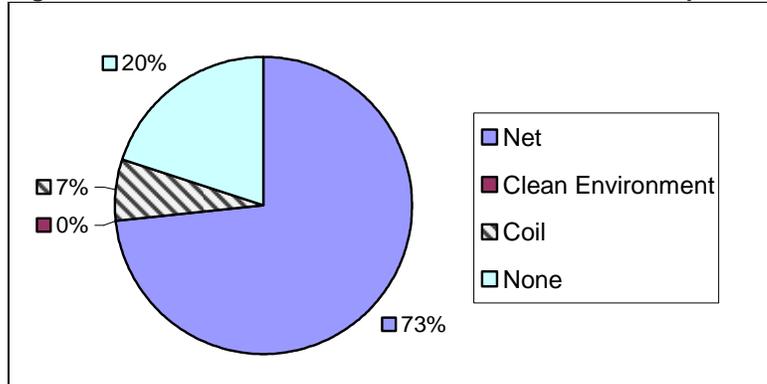
Observations of the area showed that around 80% of the households have clean surroundings with no dirt or solid waste near the house or latrine and no visible stagnant kitchen water. Solid waste is disposed of in pits or burned on a daily basis. In general, they are not in the habit of composting household solid waste although they do have the space (Error! Reference source not found.).

Figure 3.1: Decomposable solid waste disposal methods in the farming area



Mosquitoes are considered a nuisance in the area, and to have disease carrying potential, therefore 73% of those interviewed use mosquito nets and a small percentage use coils. People are acutely aware of the mosquito-borne diseases prevalent in the area almost to the extent that it seemed to eclipse concerns over other environment related health problems.

Figure 3.2: Practices of farmers to reduce the risk if mosquito borne diseases



Sanitation and Hygiene Practices

The dominant latrine type in the villages is pit type latrines, made of a ceramic squatting pan fixed on a concrete base and enclosed with walls made of bricks and metal. They are always built away from the house and over 70% of those interviewed said that their latrines are over 10 feet from the house. According to the community members approximately 15% of these have septic tanks, with the remainder having simple pits.

All men and women have access to a latrine at home as there are no public latrines in the area. Although quantitative data was not collected, those farmers interviewed said that all farmers have their own latrine facilities and in general they do not share them with other households. During working hours and at night some farmers (7%) urinate in the open. More common is open defecation by young children (13%), which is cleaned up by their older family members and buried; most (82%) however use private latrines.

There is no direct water supply to latrines and most are over 10 feet from water sources. The majority (67%) had a bucket for water inside the latrine although at the time of observation not all of these were filled (Figure 3.3). The use of soap was difficult to assess, as although the piece of soap was visible close to the toilet, it was often dry (Figure 3.4). There were no human excreta observed on the surface of any of the latrines.

Figure 3.3: Observed water use in latrines in the farming area

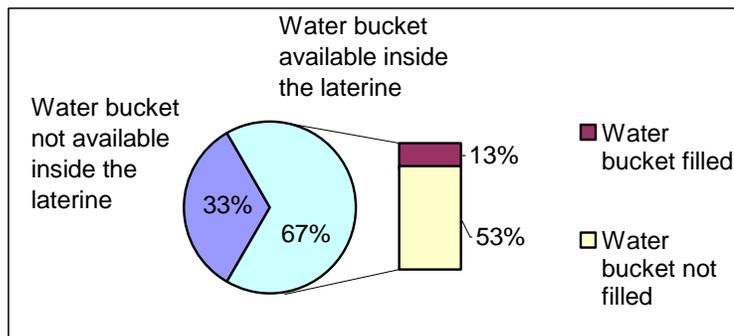
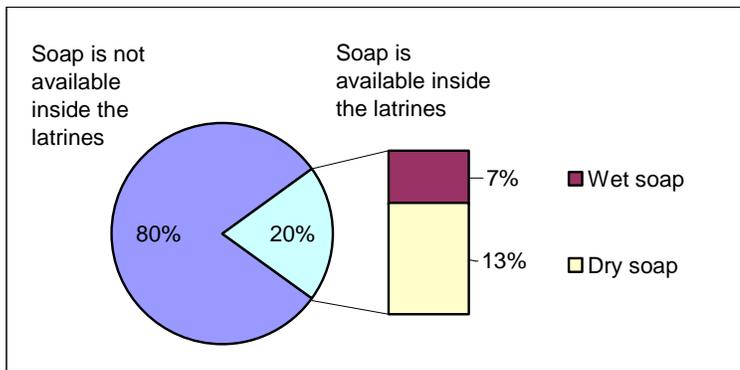
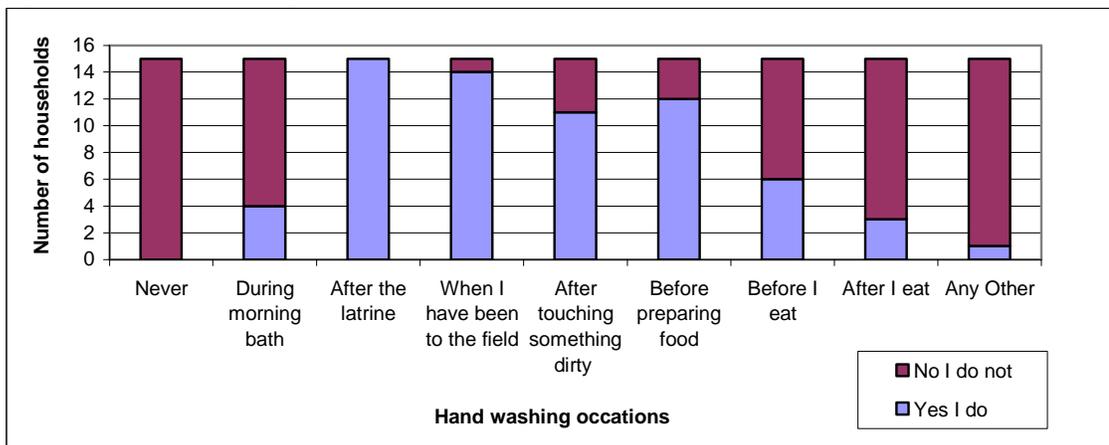


Figure 3.4: Observed soap use in the farming area



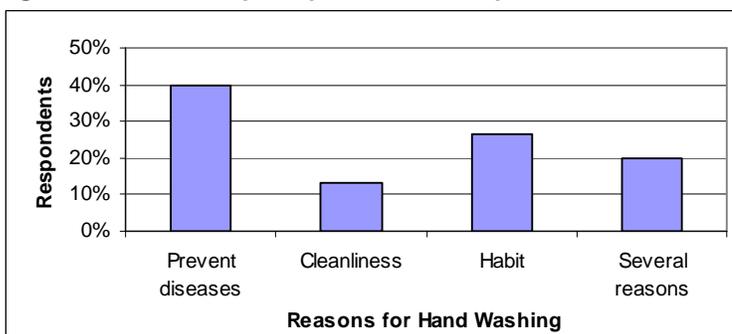
It was clear from the discussions with the farmers' families that the habit of hand washing after defecation is well entrenched in the daily lives of the community. They say that they wash their hands immediately after coming from the field, before food preparation and after touching something dirty. Surprisingly however, 40% do not consider hand washing to be an important practice prior to eating (Figure 3.5).

Figure 3.5: Hand washing practices of farmers



A little over 25% said that they wash their hands as a habit and just 40% of the interviewees know that there are health consequences related to not washing them (Figure 3.6).

Figure 3.6: Farmers' perceptions of the importance of hand washing



Most people also use a towel or a cloth to dry their hands after washing them. There was a small degree of sharing but two thirds of those interviewed use a personal towel. Often children have separate towels and adults share one, which may suggest that they are particularly concerned about hygiene for their children.

Water Quality and Use

The interviewees have not experienced any problems with the quality of well water and do not see the need for chemical analysis or tests for microbial contamination because they could assess its quality by color, odor and taste.

Observations of water storage revealed that all households store water and that containers are kept clean and closed. The drinking water containers are mostly earthenware (59%) or aluminum (41%), whereas non-drinking water is stored in a variety of containers including aluminum (40%), earthenware (32%), plastic (20%) and brass (8%). Water is sometimes filtered through cloth before drinking and a couple of people boil it because they have poor health, but in general it is consumed without treatment.

An assessment of domestic water consumption showed that those interviewed use 15-20 l per person per day, for activities such as washing after defecation, hand washing, washing household items and other household hygiene practices.

Dental Care and Food Hygiene

Herbal plants or toothpaste are used for cleaning teeth and although the survey results suggest that all farmers use toothbrushes on close questioning it was revealed that adults often use plant based material or charcoal, whereas the children and young adults tend to use toothpaste and toothbrushes. Young children are made to brush their teeth twice a day, a practice that the adults do not adhere to, as admitted by the adults themselves.

The food hygiene aspect was not evaluated extensively but the few questions that were asked revealed that over one third of respondents do not wash raw fruit and vegetables prior to eating them.

Figure 3.7: A well and toothbrushes in the village where the farmers lived



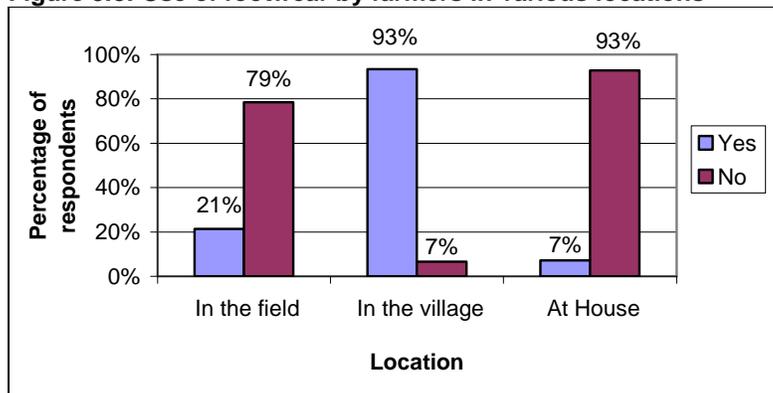
Agricultural Practices and Health Risks

All of the farmers who were involved in the study use polluted canal water as there is no other source of irrigation water to their fields. The discussions and interviews did not reveal clear relationships between the use of this canal water and health risks, but there were clearly some perceptions of health problems. The farmers felt that the use of canal water caused skin problems, such as rashes, especially during the period in which they prepare the land and are therefore in contact with the water for long periods of time. They also suffer injuries resulting from the solid waste entering their fields, particularly glass and sharp items. In addition they feel that the presence and use of wastewater from the city leads to an increase in the incidents of filaria, which is spread through mosquito vectors.

The agriculture survey which was undertaken with a larger sample of wastewater and canal water farmers, asked two questions related to health impacts of wastewater irrigation. The same key observations were made by farmers in that survey too (Jayakody et al. 2007). Informal discussions that were held during this survey also highlighted a concerning fact, which is that farmers rinse their hands in the polluted water and may unintentionally wipe their mouths and faces.

The potential health risks from using wastewater are probably compounded by the fact that nearly all the farmers interviewed do not wear even slippers in the field, something they attributed to the fact that they consider the field a sacred place. In contrast, 93% wear slippers in all other places in the village, except in the house (Figure 3.8).

Figure 3.8: Use of footwear by farmers in various locations



4 Results and Discussion – Wilgoda Community

Infrastructure, Facilities and Environment

The background study undertaken in Wilgoda in 2006 showed that there are two types of official MC housing units: “quarters” (n=24) and “line rooms” (n=52). Both of these are approximately 250 ft² in size. The “quarters” consist of a kitchen, two rooms and a portico, while the line rooms have a kitchen, portico and large hall without any partitioning. With time, the population has grown within the community and *ad-hoc* additions have been built to the existing structures, by the community members. Only some of these have been granted legal status to date. In total, 84 houses (74%) have legal status (Nishshanka, *et al.*, 2006, Practical Action, 2007). The rest are one-room temporary houses of approximately 100 ft², constructed by community members.

The quality of the housing structures is variable with most in a state of disrepair (temporary repairs with polythene and metal are quite common). They differ considerably in terms of the roofing, floor and wall materials. In general, the houses constructed by the municipality have tiles (37%) or asbestos roofing (42%), with a few having metal sheets (5%); many of the “illegal” dwellings use metal sheets (30%) (Figure 4.1 and Figure 4.2).

The majority (92%) of both illegal and legal structures had cement floors (25 and 80 housing units respectively); with just five illegal and four legal structures having mud floors. Walls were more difficult to categorize as they were often constructed from a number of materials including wood, metal sheets and meshes, especially the internal walls. However if the dominant building material is considered, then 77% were constructed from brick. (Nishshanka *et al.* 2006).

Figure 4.1: Types of roofing material

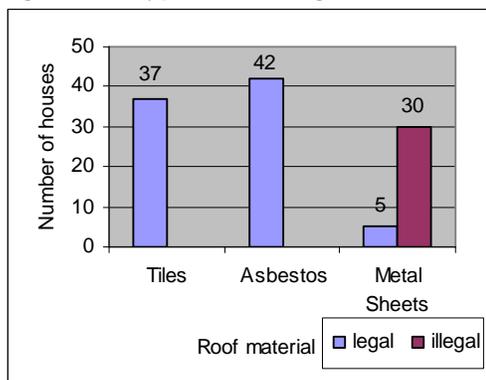
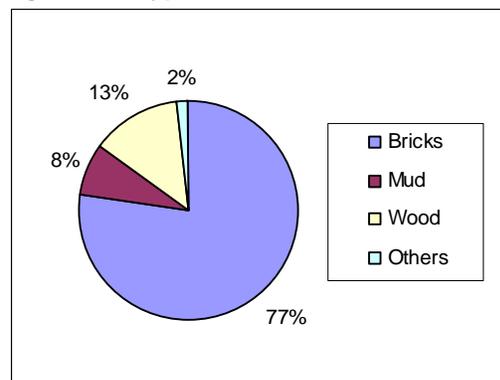


Figure 4.2: Types of wall material



Source: Nishshanka *et al.* 2006

The area in general is not well developed but there are some basic facilities in the area including a few tea shops, a pre-school, a community hall and public latrines. Although the area is owned by the MC they do not undertake maintenance of this communal infrastructure and community involvement in this is also very limited.

Some houses are supplied with pipe-borne water and electricity, but this has not kept pace with the new constructions and population increases within this community. The electricity supply is provided to 46% of households, and 7% use their neighbor's connection. Those who have their own connection pay for the electricity (Nishanka et al. 2006). The majority of households use shallow wells and a tube well that are located in the area for washing household items and bathing. There are also three common taps connected to the municipal water supply system; these are used by 89 households for all purposes particularly drinking water but also for bathing, washing and sanitation. Only 24 households (15%) have private household connections for which they pay the National Water Supply and Drainage Board (NWSDB) and one person uses their neighbor's supply (Nishshanka et al. 2006).

The external environment was observed to be not very clean, as there is no ownership of the immediate surroundings and houses are closely clustered without much space around them. Most of the temporary dwelling places were not clean; defecation and urination was visible (Table 4.1). Common places were not kept clean and there was plastic debris such as shampoo packets and soap covers all over the area. The community appears to lack awareness of environmental sanitation.

Table 4.1: Observations of cleanliness in the households interviewed

Observation question	Yes (%) (n=10)	No (%) (n=10)
Is there dirt (fecal material) which can be seen from outside? [*]	40	40
Is the surrounding of the latrine clean?	50	50
Solid waste is disposed to the surrounding.	0	100
Kitchen wastewater is stagnated on the ground	0	100
Overall cleanliness inside the house	100	0

^{*} Latrines could not be observed for two households because they did not have private facilities and were too far from the public latrines.

All wastewater from the houses is drained to the Wan Ela through the drainage lines but after the rains the water tends to get collected in the uneven spaces on the ground. The already polluted environment becomes worse when urine and excreta are all mixed after the rains, and foul smells pervade in the area; this is very unhygienic for the community members.

In contrast to the state of the external environment, the insides of the houses that were observed were clean despite the cramped nature of the houses. This suggests that people are concerned with cleanliness but that their ability to maintain the external environment is limited because of lack of community spirit and ownership.

Five houses have compost bins given by the Integrated Urban Development Program undertaken by the organization Practical Action, and it appears that these are being used well. However most people in the area leave their garbage in two locations from where it is collected by the MC. These dumps were covered in flies and other insects, and could potentially pose a health risk to the residents.

Sanitation and Hygiene Practices

Identifying the total number of sanitation facilities proved to be difficult. The baseline survey conducted with all 114 households in 2006 documented 31 latrines that were privately owned and built by the municipality. There were a further eight shared facilities were built by an NGO for the line houses. According to the respondents the public facilities were used by 78 households (414 people) (Table 4.2). However, during the social mapping of the area 23 public and 36 private latrines were noted. Of these, 14 are very old and nine newer latrines were apparently built by the church.

The latrines have either septic tanks or pit holes that are not covered. Pits from the public latrines appear to be located too close to the canal (<10 m distance). When the latrines are full they are emptied using the MC gully-suckers, but there are complaints that they are not emptied properly, leading to them overflowing the squatting pans. This is unpleasant and attracts flies.

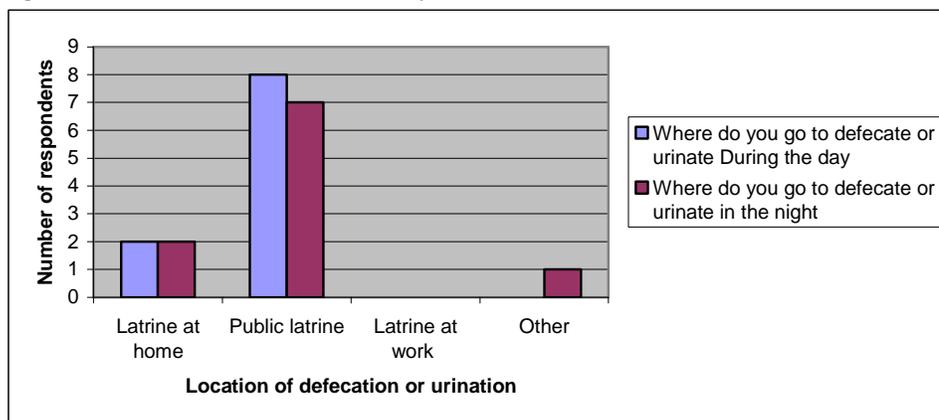
Table 4.2: Latrine facilities in Wilgoda Line

Latrine	People		Households	
	Number	%	Number	%
Individual	155	26	31	27
Shared	414	71	78	68
Neighbor's	18	3	5	4
TOTAL	587		114	

Source: Nishanka et al. 2006

Privacy is an issue, especially for women as the latrines are not gender segregated. Usually, there is a rush in the mornings, and shared facilities have long queues. At night, some people use polythene bags to defecate in; these bags are thrown into the canal during the day earning themselves the name “flying toilets”. The detailed interviews showed some people who use the public latrines use other places for defecation and urination in the night (Figure 4.3).

Figure 4.3: Use of latrine facilities by the households interviewed

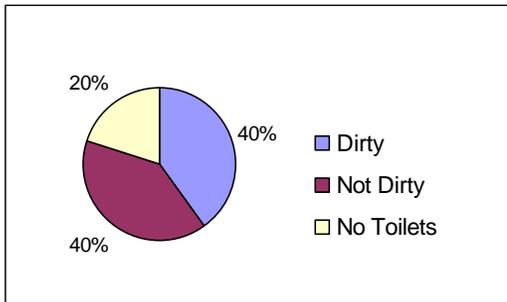


Children often use the canal banks to defecate and the compounds around the homesteads to urinate. Small children were seen defecating in and around the area with no adults to supervise their hygiene behavior. Half the interviewees said that it was common practice for children to defecate in the open and to throw stools of infants into the drainage canal.

The public latrine maintenance and cleaning is shared by community members, with an understanding that three households are responsible for one latrine. It was noted that the 10 new latrines are kept locked by the households responsible for maintenance and only used by specific households. These latrines were observed to be clean and washed. The old latrines are not locked and in some cases the doors are broken down. They are badly maintained with urine and fecal matter on the squatting pans and on the concrete surrounding the latrine. The older latrines are in a much worse condition than the new ones. No water or containers were seen in the public latrines and water is carried there by individuals when they went to use them. Soap was also absent.

Private latrines are well maintained, but no one keeps water and soap for use inside the latrine. They keep the soap near the kitchen, water source or washing place, therefore, it is difficult to say whether they wash their hands after each trip to the latrine. The people are knowledgeable about good hygienic practices (probably as a result of several projects that have taken place in the area over the years) but it is difficult to gauge if they practice them.

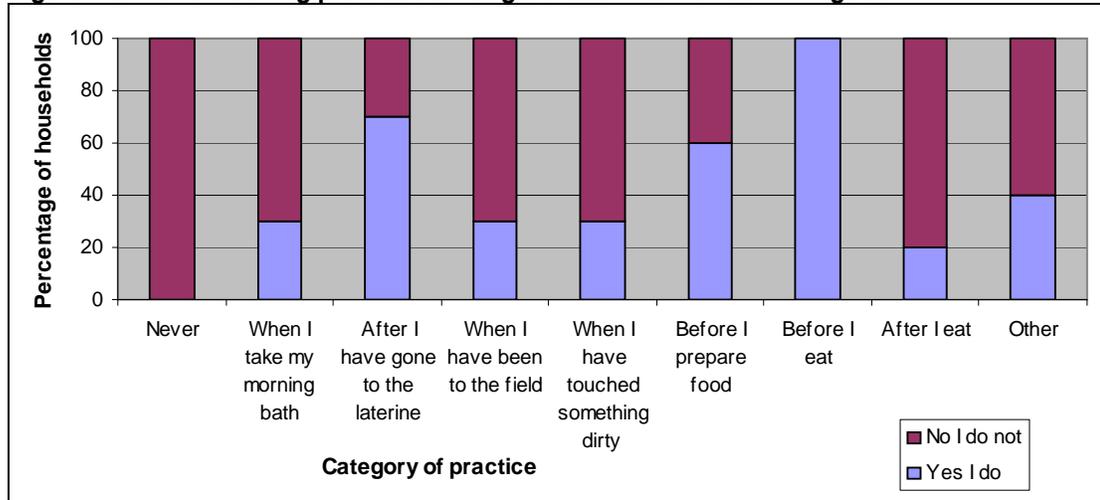
Figure 4.4: Observed cleanliness inside the latrines



Everyone who were interviewed said that they wash their hands before taking a meal but only a small percentage wash their hands after a meal. Most also wash their hands after using the toilet and over half do so before they prepare food (Figure 4.5). Most of these people use soap, and explained that they wash their hands to reduce the spread of disease.

Most adults and even most children in the households interviewed use slippers when they go to the latrine. Many people share towels within the family but as with the farming households children usually have their own towel. The majority (80%) use tooth brushes, which was corroborated by observations of tooth brushes.

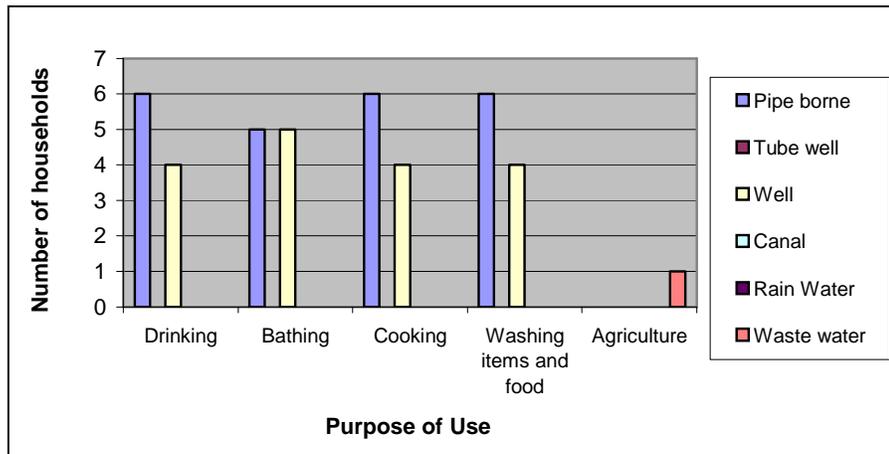
Figure 4.5: Hand washing practices amongst those interviewed in Wilgoda



Water Quality and Use

Although the social mapping revealed that there are privately owned and public taps connected to the municipal water supply, a tube well and open wells, the 10 households with whom detailed discussions were held only use piped or well water for all domestic purposes (Figure 4.6). However, the water from tube wells is not suitable for domestic use, according to community members, and some people have to walk quite a distance from the house to collect water.

Figure 4.6: Water sources and purpose



Despite the lack of facilities, the kitchen equipment and water containers are kept clean. Water containers are kept closed with a clean lid. The people interviewed only used aluminum and plastic containers for storing non-drinking water, with a roughly even split between the two. A larger proportion used aluminum containers to store drinking water, followed by plastic and earthenware.

Water use per household for hygienic practices and cleaning (but excluding bathing) range from 20 to 70 l per household per day, which is around 3-25 l/person per day. For those at the lower end of this scale it is obviously inadequate, and is linked to the absence of a water supply near the latrines.

It was observed that water was wasted when the open taps were used for bathing and this has led to conflict between the MC and community, since the community does not pay for this water. The result of this conflict is that the MC has removed the tap to reduce consumption. Reducing the quantity of water wasted by the community would therefore improve relations between them and the MC and may ultimately result in improved facilities.

Health Problems

Health clinics conducted by Practical Action found that many children are malnourished. During the health camps children are given anthelmintics and vitamins. A large number are also suffering from coughs and colds. Saliva samples were taken from these subjects to test for Tuberculosis. Many had eye problems, with a total of 141 people requesting spectacles. Other illnesses were not reported on that day (Personal communication, Lalith, Practical Action, 2007)

Of the respondents involved in the WASPA Asia study, three were currently affected with filariasis and community members feel that there could be others who might be carrying the disease. They are aware that there are medicines to be taken and early diagnosis is possible.

There is a perception in the community that alcoholism and even drug abuse is a big problem. Visits to the area reveal a high use of tobacco, chewing of various substances and alcohol consumption.

Many children seen playing in the area had rashes, including small children who had no clothes on and whose skin could therefore be clearly observed. Without medical advice it is impossible to explain the cause but the unhygienic environment may be a contributing factor.

Gender sensitive problems are prominent; some families have built temporary covered places for bathing for young female children since they feel uncomfortable when bathing in open places. Washing of sanitary towels (cloths) is also very difficult.

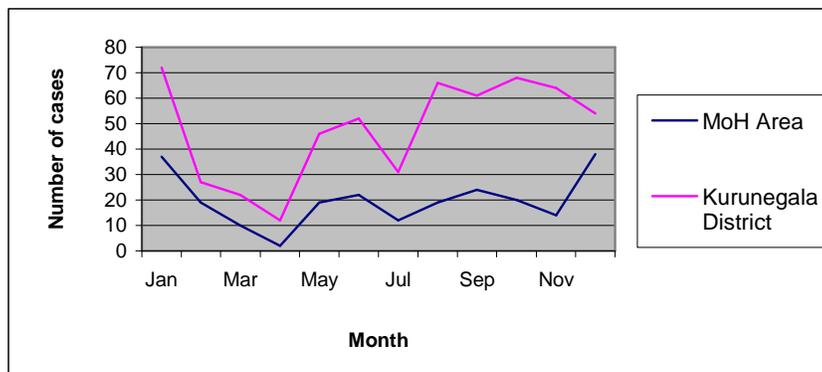
5 Disease Prevalence in Kurunegala

The Kurunegala Medical Officer of Health (MoH) Division is one of 18 MoH Divisions in Kurunegala District. The MoH is under the Ministry of Health of the Provincial Government and is responsible for all health related activities of the Division. In addition to this the MC has two Medical Officers of Health and several Public Health Inspectors (PHIs) that monitor the Municipal Council area.

Both the farmers and Wilgoda community are within the Kurunegala MoH area. To get an overview of the most prevalent water related diseases in the area, the government health statistics were collected. From the 2006 epidemiological reports it is clear that a number of water related diseases were prevalent. Among the vector borne diseases: dengue fever (DF) and dengue hemorrhagic fever (DHF); filariasis; malaria; and chikungunya are of concern in the area. Other water and food borne diseases such as: dysentery; enteric fever; viral hepatitis; and leptospirosis, were the most prevalent health problems recorded. Data on other water related health impacts such as heavy metal poisoning, chronic skin diseases, pesticide poisoning and renal failure were not collected during this study.

Kurunegala District is considered to be a high risk area for DF and DHF, and is within the 13 MoH areas identified for active control and prevention activities (www.epid.gov.lk, accessed 30th August 2007). In 2004, DF cases rose to epidemic proportions in Sri Lanka, and a national action plan for prevention and control of the disease was outlined for the period 2005-2009. Thus, in Kurunegala, there is an active campaign for the control of the vector *Aedes aegypti* which is an aggressive day time biter and a container breeder. In 2006, case numbers increased to close to the numbers reported in 2004, totaling 11979 for the whole country and the disease prevalence pattern in the Kurunegala MoH Division matched that of the District with the exception of the latter part of the year (Figure 5.1). Nearly half the cases reported came from the Kurunegala MoH area. This is understandable given the high density of population in this MoH area and the closeness of the housing units in the area.

Figure 5.1: Reported DF and DHF cases in Kurunegala District and MoH Division in 2006



Source: Municipal Council Epidemiology Unit 2006

There is clearly still scope for better management as this vector species can breed in a number of artificial containers ranging from discarded yogurt cups to water storage containers. The observed garbage dumps are seen as potential breeding grounds and a good action plan for garbage disposal appears prudent. In the farming community environs, although such garbage dumps were not visible, the plant types that can collect water in their axils can be potential breeding sites. Health education and getting rid of such plant types will be a timely intervention.

Chikungunya is another vector borne disease transmitted by the same mosquito. It is not as life threatening as DF and DHF but has debilitating manifestations, reported from many parts of the district. Case records for the area are not available for reporting.

Filaria is endemic in this region, and as such prevention and control has been built into the health system. Recently, there was a mass drug administration (MDA) campaign launched within the island, with the aim of reducing the loads of the circulating parasite *Wucheraria bancrofti*, spread by the mosquito *Culex quinquefasciatus*, which loves foul water. Both study groups are vulnerable in that it can breed in the canal as well as in pit latrines. Community awareness was high on the debilitating nature of the disease. In 2006, 21 blood samples were positive out of 58555 total samples from Kurunegala District and 16 of those positive cases are from Kurunegala MOH area. This is a small number but according to the PHI of the filaria control unit, approximately 50 patients have chronic filarial in Wilgoda and around the anicut.

Although the community complained of malaria, the disease incidence has been on a downward trend in the whole country since 2000. In Kurunegala District there were only two cases of *P. falciparum* (severe malaria) in 2006 (Table 5.1). Having a slightly different lifecycle and causing less severe disease, *P. vivax* appears to maintain a low level of infections, and is more difficult to contain with its ability to hide and evade drug action. Increasing drug resistance is an emerging issue, though not a huge problem as in other countries.

Table 5.1: Malaria cases recorded in Kurunegala District

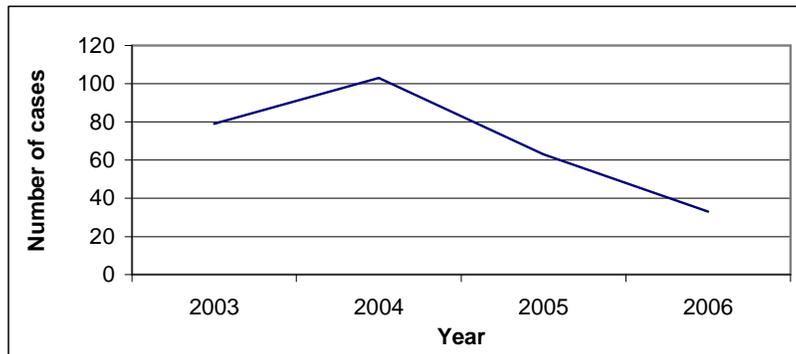
Year	Blood sample	Positive	<i>P. vivax.</i>	<i>P. falciparum</i>	Mixed infections
2000	144244	8063	6567	1437	59
2001	121119	4753	3961	753	39
2002	121114	2251	1845	380	26
2003	92219	451	412	33	6
2004	79732	208	201	5	2
2005	70538	125	123	1	1
2006	88130	115	111	2	2

Source: Kurunegala Malaria Control Unit 2006

Dysentery can be caused by a number of infectious bacteria. The main symptoms are bloody diarrhea, fever and stomach cramps. Unhygienic practices and contaminated food are the main source of infection. Bacterial species belong to the Genera *Shigella*, *Campylobacter*, *Escherichia*, and some strains of *Salmonella* have been identified as important agents of

dysentery. Apart from bacteria, the protozoan parasite *Entamoeba histolytica* can also cause amoebic dysentery. Specific diagnostic tests have to be carried out to identify the different causative agents. In the MoH area, a decline in the number of cases of dysentery is noted, however, cases could be under-reported as many would take home remedies and might not seek treatment at government facilities (Figure 5.2). The Wilgoda community members are the most likely members to be affected, and health education can play a preventive role.

Figure 5.2: Cases of dysentery in Kurunegala MoH



Source: Municipal Council Epidemiology Unit 2006

Food poisoning can be caused by several agents of which species belonging to the genera *Salmonella*, *Escherichia* and *Listeria* are cited as being the commonest. Since most food poisoning is mild and passes away, the cases do not get reported. It is difficult to assess the health status regarding episodes of such illnesses in a community, unless more time is spent observing their daily lives during the assessment process. A slight increase in the number of cases was reported for the MoH area in 2006 but only totaled eight cases (MC Epidemiology Unit 2006).

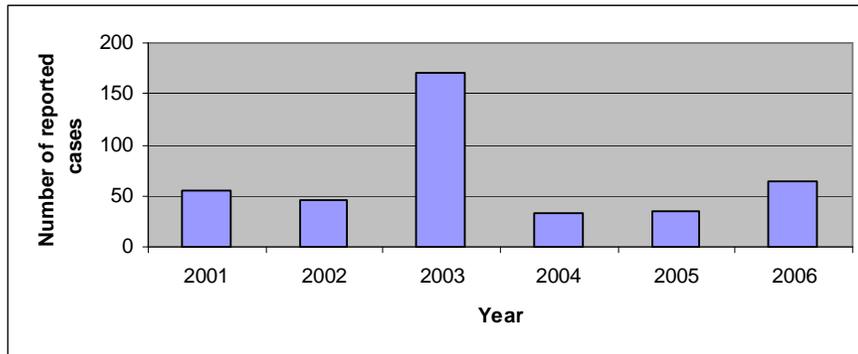
Typhoid fever, also called enteric fever, is caused by *Salmonella typhi* a gram negative bacillus, and spread by consuming contaminated water and food. The bacterium is passed in the stool and urine of infected people. Inadequate hand washing after defecation or urination may spread the bacteria to food or drink; and inadequate treatment of sewage may lead to contamination of water supplies. Flies may spread the bacteria directly from stool to food. Only a few cases have been reported for the MoH area, ranging from 9 in 2003 to 7 in 2006 and dropping to just three in 2004 and 2005 (MC Epidemiology Unit 2006). However, this may be due to under-reporting.

Viral hepatitis is endemic in certain parts of the country and is transmitted through the faeco-oral route. Outbreaks occur, via contaminated water and can be transmitted from person to person, from close contact. In conditions of congested living, the disease can spread easily. The reported cases are low, for the MoH area at just one case in 2006, down from 32 in 2003 (MC Epidemiology Unit 2006). Again this could be because of varied treatment seeking behavior leading to under-reporting of cases.

Leptospirosis, is caused by a bacterium and is a notable disease in Sri Lanka. Humans contract the disease when ingesting contaminated water or food (by urine of rodents or

animals which carry the bacterium). Untreated it can be fatal. There has been a country-wide increase in the number of cases reported and the government has now identified sentinel MoH areas to better understand the epidemiology of the disease and to plan appropriate prevention and control strategies. Farming communities can be more vulnerable as rodents carrying the bacteria can increase during the harvesting season and can easily spread the disease to humans, by contaminating the water storage containers.

Figure 5.3: Leptospirosis cases in Kurunegala



Source: Municipal Council Epidemiology Unit 2006

6 Discussion

The conditions in the two communities are quite different: the farming community is spread over a larger spatial area than the low-income community, and is in a location that is officially considered rural, although it is on the periphery of the city. Consequently the households are further apart, giving more space. The farmers also own their houses and their land which gives them a greater incentive to keep them clean. Waste is buried or burned, although there is adequate room for composting in the home gardens.

In Wilgoda the environment is polluted with debris and excreta, and there is no defined place for garbage disposal, so it is left in heaps. The drainage canal flowing past the houses carries foul smelling water and is also used as a dumping ground for garbage. Very few people compost their waste, although another donor project is working to introduce composting and recycling.

The construction of the houses in the two areas was also different, with the farmers having more permanent structures. This is linked to the fact that many of the families living in Wilgoda do not have legal status and the MC will not grant it. Houses were kept tidy but for people in Wilgoda this was sometimes difficult, especially if they had large families.

Every one of the farming households interviewed has their own latrine and a well for drinking water. This is very different to the situation in Wilgoda where facilities are sparse, shared and are not well maintained. Access issues are made worse by the fact that some latrines are locked, and there are always long queues in the morning. The poor conditions mean that there is no privacy for women and they have to get up very early to use the facilities.

With or without access to latrines children often defecate and urinate in the open, which could significantly contribute to contamination of the environment. Some open urination by adults was also noted but it is not that common; more common is the practice of disposing of faeces into the canal in plastic bags. Sampling of this water body revealed that it contained pin worm eggs (Dissanayake et al. 2007).

Water consumption in both areas is low and was a particular problem in Wilgoda where there is no water close to the public latrines. Water quality was said to be a problem in Wilgoda and Geradigala, but not in the farming community. However none of the respondents are aware of the water quality testing facilities offered by the NWSDB therefore impressions on water quality are formed on the basis of taste, color and odor.

The use of soap was difficult to determine but it appeared that it is not used regularly as soap was found to be dry and rarely located close to latrines in either research area. Towels were often shared which can be a route for passing on diseases.

Although the canal water does not affect the Wilgoda community as much as it does the communities further down stream, it does cause a nuisance and is linked with cases of filaria and dengue. The farmers also mentioned such problems but did not highlight specific health

problems arising from using wastewater in agriculture. They do however feel that it causes skin irritations and sharp objects cut their legs. Farmers work barefoot and do not think that this causes any particular problems. They are more conscious of the poor water quality and smell than of health impacts, and are aware that it is now more polluted than in the past.

In summary the key issues identified in the study are:

- Poor infrastructure in Wilgoda.
- Lack of access to utility facilities especially water and latrines in Wilgoda.
- Access to facilities is much better in the farming community.
- Ineffective disposal of garbage in Wilgoda and no composting in either site.
- Drains in Wilgoda contain garbage, faeces and stagnant water.
- Limited knowledge or practice of hygienic activities such as hand washing before eating or washing with soap, in both locations.
- Children defecate and urinate in the open.
- There are no clear health problems that can be related to wastewater except filariasis.
- Farmers do not associate the wastewater with health problems but they do suffer from skin rashes especially during the cultivation period, as noted in the agriculture survey (Jayakody et al. 2007).
- Social cohesion in Wilgoda is poor and this, combined with lack of ownership of land and buildings, contributes to the unsatisfactory maintenance of the area and facilities.

7 Conclusions and Recommendations

Wastewater Farmers

It appears that the conditions in which the wastewater farmers live are generally good and that they have some knowledge of hygiene practices. However, improvements could be made to varying degrees in areas such as: hand washing, protection of well water, dental care and solid waste management. Care should be taken when using wastewater in the fields so that farmers do not wash their hands in the wastewater or wipe it on their faces, as was observed in the study. Some activities to improve solid waste management at the household level may be beneficial. These could include composting of biodegradable waste and even ecological sanitation.

Farmers were not very aware of the quality of the canal water that they are using for their paddy fields and are more concerned with its impact on crops than on health (Jayakody et al. 2007). Despite this, they believe that they are suffering from skin irritation due to continuous handling of wastewater in fields. Awareness and education on specific health and hygienic concerns will be important aspects in handling health and sanitation issues with farmers. Any programs with the farmers should be developed with the Department of Agrarian Services (DoAD) and Health Department.

Wilgoda Community

The existing health and hygiene situation of the Wilgoda community is not acceptable. This is partly due to inadequate infrastructure and provision of basic facilities, but also has an element of community willingness. Discussions and observations suggest that the community as a whole is not active in working together to improve their environment or facilities, except within their homes. There are however a few influential and committed people who have already expressed a strong desire to work with the WASPA team to address some of the issues that have been highlighted by the study.

The poverty prevailing in Wilgoda seems not to be financial poverty but is caused by: social problems; lack of political will; poor knowledge and attitudes; and resource scarcity and inadequate resource management. Therefore, interventions should be targeted not only at physical infrastructure, such as water supply and latrines, but also at changing behavior and attitudes. Particular emphasis should be placed on children's defecation practices, safe facilities for women, and good maintenance strategies.

Solid waste management needs to be improved and although this is being addressed by Practical Action and their partners, it is important that the WASPA project engage with them and that the two projects are mutually supportive.

All activities should be developed in collaboration with community representatives and the MC, which owns the land and is also responsible for infrastructure within the city.

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Annex I: Social Map of the Wilgoda Area

