

Can Better Houses Help Tackle Indoor Air Pollution – A Case study of Sri Lankan Tea Pluckers

Indoor Air Pollution (IAP) is a major health hazard in many developing countries. The health impact of this type of pollution is obviously influenced by various facets of house design, such as room size and ventilation. However, despite the importance of the IAP challenge, there has been little research on this aspect of the problem. To help provide some much-needed information – and to gauge the economic case for investment in better housing – a new SANDEE study has analysed the link between the labour productivity of tea-plantation workers in Sri Lanka and their living conditions.

The results suggest that the productivity of a tea worker living in an ‘improved’ house is up to 151% higher than that of a worker living in traditional houses that are more vulnerable to IAP. It also finds that investing in housing improvements and new houses for workers yields significant net benefits to both estate management and estate workers. In light of these findings the reports recommends that estate managers cooperate with the government to develop better houses for their workers.

The challenge of IAP in Sri Lanka

In Sri Lanka, IAP-related respiratory illnesses are one of the leading causes of hospitalization. IAP in the country is largely attributed to energy use within



homes, as almost 80% of Sri Lankan households use unprocessed firewood as their main source of fuel for cooking. This represents a very real health threat as research shows that the burning of firewood in the kitchen is the most significant and dangerous source of indoor air pollution in many developing countries.

There are a number of ways in which the features of a home can affect the extent to which IAP affects a resident’s health. Research shows that poor ventilation, small kitchens and cramped housing units all significantly increase the possibility of people being exposed to IAP and getting ill as a result.

To shed further light on the link between IAP, housing conditions and people’s health, the study looked at the circumstances of female tea pluckers in Sri Lanka. These workers are particularly vulnerable to IAP because they generally have small houses and easy access to fire wood. To gauge the health of the estate workers, the study looked at their labour productivity, as this is directly affected when they are ill or have to go and obtain medical treatment.

Housing on Sri Lankan tea estates

The study was conducted in two tea-estates in the Hatton region in Nuwaraeliya district, which is the largest tea-growing region in Sri Lanka. The tea-estate sector was chosen for two reasons. Firstly, up-country tea-estates in Sri Lanka are a unique sector where workers are less influenced by external factors such as political ideologies and employment opportunities. Secondly, the tea sector is a unique sector for productivity research because labor productivity is readily measurable by the amount of tea picked.

The estate housing stock consists mainly of back-to-back lines, single lines, single houses and shanties. The government provides housing for the estate workers, although they work for estate companies. Since the settlements for estate laborers date back to the 1840's, the traditional housing stock (single and back-to-back lines) in this sector is quite old and living conditions are substandard.

According to the Consumer Finance and Socio Economic Survey 2003/04, the percentage of line rooms in the estate sector was 63.4% in 2003. The 'back-to-back lines' and 'single lines' have a small floor area with either no separate bedroom or only one. In the 'lines' 10-15 (or even more) houses are compounded in a single building.

In addition to traditional housing, there is also some (about 8%) temporary housing available on tea estates. Very few of these houses have proper ventilation (about 9%) and residents' first priority is firewood for cooking (67%). The temporary house dwellers are the poorer workers, so their ability to afford ventilation devices or cleaner fuel is very limited.

Housing upgrading programmes have been undertaken in the estate sector from time to time. House upgrading has mainly involved improvements to kitchens and re-roofing. The study found that the installation of efficient stoves with chimneys has been the most popular change made in kitchens.

In addition, since 1995, the government began to collaborate with the Plantation Human Development Trust (PHDT) to provide new improved house units (instead of line rooms) for estate sector workers. As a result, the proportion of single houses in the estate housing stock has increased almost threefold, from 10% in 1996/97 to 28% in 2003/04.

Furthermore, PHDT estimates confirm that by 2010, 10% of the estate population had been provided with new single/twin cottage houses in place of their traditional line houses. In addition, living conditions in 50% of traditional lines have been upgraded. While the percentage of the working families living in traditional lines has come down to 32% in 2010, PHDT asserts that overcrowding still remains a significant problem in the estate sector.

The study was partly motivated by the need for more research on IAP and partly to help maintain high labour productivity in the tea sector in Sri Lanka. Tea production is one of the cornerstones of the country's economy, however it faces a number of key challenges, including low labor productivity, chronic absenteeism and the out-migration of the younger workforce due to factors such as low wages. Because of this the industry needs to develop credible strategies to attract a steady labour force and retain existing resident workers. One of the key aims of the study was therefore to highlight a mechanism to increase labor productivity and income and so reduce outmigration from the tea estate sector.

Collecting information on housing, health and productivity

This study used both primary and secondary data on tea-estate workers, their houses, health and productivity. The data came from two tea estates that were chosen after extensive discussions with several tea estate companies.

Key informant interviews were conducted with estate management, estate medical officers, village officers, estate overseers and estate worker representatives. These interviews were done to identify the types of housing available and the types of illnesses that workers suffer from, and to highlight relevant estate management policies. From each estate, management records were used to collect information on the labour productivity of individual tea pluckers.

A structured questionnaire survey was used to collect primary data on housing characteristics and other socio-economic information. The sample for this survey consisted of 1,004 female tea-pluckers from the two chosen estates. The survey collected data on the physical characteristics of their houses, their behaviour and socio-economic status and information on their health conditions (with special reference to IAP-related illnesses and related health expenditure).

Table 1: House-types and environmental attributes

House type	Percentage to the total in each house type							Mean value
	Use of ventilation devices inside houses	First priority for fuel wood in the kitchen	Use of safer stoves other than improved stoves	Use of improved wood stoves with chimney	Availability of piped water	Availability of hygienic latrine	Bedroom congestion (average bedroom occupancy)	
Traditional and old	9.24	74.37	13.03	10.08	76.05	80.25	4.57	1.77
Temporary houses	8.86	67.09	11.39	20.25	81.01	89.87	3.96	1.91
Improved houses	23.00	65.40	23.84	20.25	78.27	87.34	4.22	1.81
New housing scheme	15.05	62.62	18.45	18.45	84.47	97.09	3.65	1.87
All house types	16.95	67.10	19.16	17.45	79.24	87.86	4.17	1.82

Source: Author calculations using sample data

The tea-pluckers' housing stock

The most important variable for the study's analysis was housing stock. Based on field observations, information provided through the key informant discussions and information from the Estate Housing Survey Report of 1994, the study classified estate houses into four categories: a) traditional and old houses, b) temporary houses, c) improved houses and d) houses provided under new housing schemes.

Traditional and old house structures were judged to be more vulnerable to IAP than improved houses and houses in new housing schemes. This assessment was based on the following factors: the use of ventilation devices, fuel-wood, safer stoves and improved stoves with chimney, access to clean water and hygienic latrines, bedroom congestion and the availability of a safer kitchen. For example, only about 10% of traditional houses had improved cook stoves with chimneys (the average across all the house types was 17%). Similarly, people living in traditional houses had much less access to ventilation devices than those living in all other types of houses. (For more information on housing conditions, see the side bar.)

Housing conditions and productivity

The study found that workers living in houses that were not vulnerable IAP were up to 148% more productive than workers in IAP-vulnerable house types. This finding shows that improving the living conditions of tea-estate workers should benefit both workers and estate companies. While the workers may benefit from both increased wages (due to their increased labor productivity) and reduced health costs, tea-estates are likely to benefit from increased labor productivity.

Given its findings about the impact of housing stock on productivity, the study looked at the financial gains that would be produced by carrying out home improvements and providing estate workers with new homes. It calculated that workers are likely to benefit annually by between LKR 20,271 (\$ 156) and LKR 26,691 (\$ 205) for house improvements and by between LKR 30,414 (\$ 234) and LKR 40,048 (\$ 308) for new houses.

The study also found that tea estate companies are likely to benefit from productivity gains. For example, the estate companies in the study would benefit by LKR 129,527

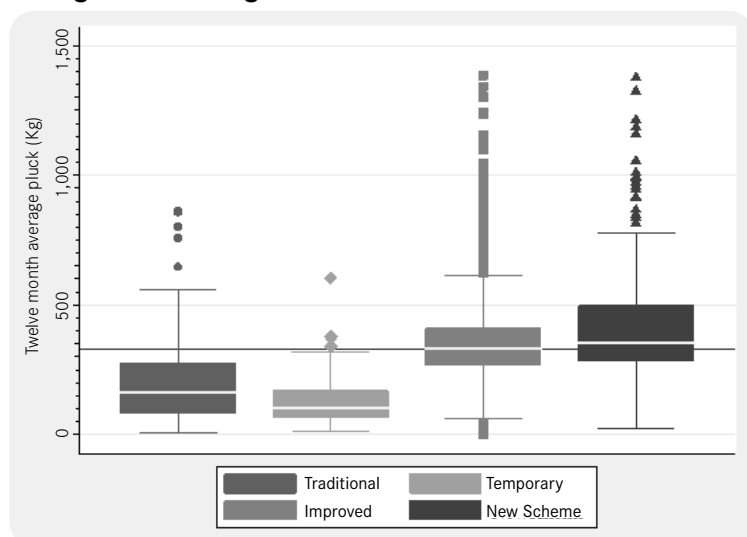
(\$ 996) a year if a worker is provided with a new house at the age of 18. The study found that the estate companies would even benefit if a person were given a new home when they were close to retirement age, although the benefit would be less.

The cost of Investing in new worker houses

Given their findings about the benefits of providing new houses, the researchers selected this approach as a potential key policy initiative to shift those living in polluted housing (traditional and old houses) to more healthy, IAP-free homes. They selected the ongoing estate housing project administered by the Plantation Human Development Trust (PHDT) as a reference investment alternative.

To help the researchers look at the economic case for this investment, PHDT provided them with the cost estimates of constructing a brand new 550-square-foot worker house under its Estate Worker Housing Project. These estimates were used as the average cost of providing improved housing for workers. The cost of shifting workers from an IAP vulnerable house to a new safe house was estimated to be LKR 1,235,000 (\$ 9,500) per housing unit.

Figure 1: Productivity differences (kgs of tea leaves plucked) among workers living in different houses



Investment options for IAP reduction

The study found that, if an estate company were to carry the full cost of new housing, then they would pay out more than they would receive in benefits from increased productivity. However, if the government provided improved housing to estate workers, then the estate company would enjoy significant gains. The study therefore suggests that estate companies may have an incentive to share costs and cooperate with the government to provide improved housing for their workers.

SANDEE

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For example, the government may be willing to bear a part of the cost of the existing estate worker housing project under PHDT, whilst the remainder could be borne by both the estate companies and their workers or by estate companies alone. Another option would be for the government to introduce a low-interest loan scheme to finance the cost component borne by estate companies and workers. There is a precedent for this, as estate companies currently cooperate with the government in an estate housing project administered by the National Housing Development Authority (NHDA).

Is such investment feasible?

To see how feasible such an approach would be, the study calculated the cumulative benefits if the estate companies bear half the cost of the investment in new homes for their workers. The assessment showed that investing in houses for younger workers would yield high financial benefits for the companies. For example, the cumulative value to an estate company of providing half the finance for a new house for an 18-year-old worker would be up to LKR 1,122,244 (\$ 8,633). The assessment also showed that these benefits would stay positive even for older workers.

The same calculation was repeated to see if it would make financial sense for workers to invest in their own homes. The findings suggests that the workers cannot afford to invest 50% of the cost of their housing, as their net benefits (from increased productivity and reduced health costs) would be low. However, workers of all age groups would be better off if they invested a 20% share in the cost of a new IAP-free home. For example, an 18-year-old worker would benefit by LKR 230,185 (\$ 1,771) from such an investment. For a worker of age 46, the 20% investment would still provide a positive net benefit, though this would be very small.

Government help is needed to capitalise on benefits of better housing

The study shows that there are significant gains to estate companies and to workers if improved houses are provided to the workers. These gains are in the form of increases in worker health and productivity.

Current estate housing projects are mostly funded by the government. The study suggests that there will be significant gains to workers and to estate companies if such projects are continued. In addition, its findings indicate that an effective housing investment program could be designed with partial contributions from estate companies and workers.

The study suggests that the benefits are such that estate companies may be willing to bear 50% of the cost of worker houses. Because of the health and productivity improvements they would obtain, the study also suggests that workers should also consider contributing at least 15%-20% of the investment in their new dwellings. However, the study concludes that the government's role in terms of providing concessionary financial backing and matching investment will be of immense importance and should be encouraged.

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