R8491 Synthesis of peri-urban interface knowledge
- Urban Waste Reuse Component -

The challenges of urban waste use as a means to enhance the livelihoods of peri-urban poor people

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This report is the outcome of a synthesis study that assimilates the findings from a number of NRSP research projects on the peri-urban interface, focusing particularly on the reuse of urban waste in peri-urban production systems. The following NRSP projects were explored:

- R2148 Farmer use of urban waste in Kano
- R6446 Review of the use of urban waste in peri-urban interface production systems
- R6799 Kumasi Natural Resources Management Research Project
- R7099 Improving Utilisation of urban waste by near-urban farmers in the Hubli-Dharwad City Region
- R7854 Further knowledge of livelihoods affected by urban transition, Kumasi, Ghana
- R7867 Filling gaps in knowledge about the peri-urban interface around Hubli-Dharwad
- R7872 Renewable natural resource-use in livelihoods at the Calcutta peri-urban interface

In addition, some of the current literature on urban waste use and reuse has been looked at to assess the originality of the findings in the above projects beyond their duration.

Introduction

Due to strong links of the peri-urban interface (PUI) with urban areas, particularly because of the proximity of the PUI, peri-urban dwellers reuse the waste produced in urban areas. The cases studied show a lot of similarities among them, with some exceptions that can mainly be linked to variations in culture and tradition.

In all the locations studied, urban wastes, both solid and liquid, constitute a valuable resource for many peri-urban dwellers, especially the poorer ones. Urban wastes are primarily reused in farming and aquaculture activities. The use of urban wastes in peri-urban production systems can contribute considerably to improve the management of both solid and liquid waste in urban areas, with an additional potential to enhance the livelihoods of peri-urban poor people. Yet, most practices of using wastes are largely informal and thus currently not endorsed in any formal strategy for urban waste management or poverty reduction.

The following sections illustrate how urban waste has been used in the various cases and the challenges that predominantly peri-urban poor people increasingly have to face in that respect. The final section pays particular attention to the missing connection between the management of urban waste

and its reuse in peri-urban areas, which seems to present the greatest impediment for sustainable solutions in both areas.

1) The use of urban wastes in the peri-urban interface of Kumasi, Hubli-Dharwad Kolkata and Kano

In all cases the use of solid and liquid waste for agricultural and aquacultural purposes is not a planned activity but rather emerged accidentally and has been maintained mainly due to economic reasons. The relatively easy and to a large extent free access to sewage and solid organic waste is a crucial factor for poor and very poor people to engage in agricultural production since it can be a cheap resource to irrigate and fertilise plots.

1A) Using liquid waste

In Kolkata, the use of liquid waste in aquaculture and farming has been a tradition for more than a century (Mukherjee, 2003; R7872 FTR Annex C). After some opportunistic farmers started to exploit sewage as a resource to cultivate fish and vegetables, a secondary canal network throughout the peri-urban interface (PUI) was constructed. Sewage from the fish ponds is subsequently used in horticulture and rice farming. The livelihoods of many peri-urban poor in Kolkata are intrinsically tied to the use of urban waste in aquacultural and agricultural activities (Kundu, 2005; R 7872 FTR Annex A). However, the problem of siltation has made it more and more difficult for farmers and fish cultivators to easily access it (R7872 FTR). As a consequence, many of them now have to use pumps to access sufficient amounts of wastewater, posing a financial constraint on the poorer ones among them.

The irrigation of agricultural plots with wastewater In Hubli-Dharwad, Kumasi and Kano is not a long-established tradition like in Kolkata, but started to occur due to inappropriate wastewater disposal and treatment that led to the contamination of surface streams (R7867 FTR, R2148 Visit Report; Keraita et al., 2002). At the same time this inefficiency provides a valuable input for crop farmers. Since the municipal government in all three cases is unable to fulfil their legal requirement of properly discharging and treating sewage, farmers with their plots in close proximity to the sewage-bearing streams use the effluent to irrigate vegetables, field crops, fodder grass and agroforestry areas (R7867 FTR; Lewcock, 1995). This rather incidental and informal practice not only irrigates the plots but provides additional nutrients to the soil. However, such practice is also associated with a number of health risks[1].

Contrary to the agriculture and aquaculture practices in Kolkata and Hubli-Dharwad, sewage in Kumasi is used for irrigation purposes only, despite the fact that farmers are aware of the fertilising effect it can have (Drechsel, et al., 2000 cited in Keraita et al., 2002). This attitude can be associated with the general lack of tradition in using urban waste in peri-urban production systems.

[1] The health impacts of the use of liquid waste are discussed in more detail at a later stage in this report.

Interestingly, in Tamale, a municipality in the Northern region of Ghana, and Accra, the country's capital, sewage sludge and nightsoil are widely used to fertilise agricultural plots. To fully understand the difference in perception and application across the country and their possible links to cultural differences, further research would be required.

1B) Solid waste

The main purpose of using organic solid waste in peri-urban agriculture is the supply of additional nutrients to the soil. Similar to liquid waste, the ample use of solid waste has been associated with its easy accessibility and low price. In fact, garbage farming in Kolkata was triggered by the establishment of the city's waste disposal site in the periphery in the 18th century. Still today the use of urban waste is largely confined to horticultural plots in the surroundings of the site (Kundu, 2005; R7872 FTR Annex C). Peri-urban dwellers generally take advantage of this resource due to their close proximity to urban areas where most of the waste is generated.

Solid waste has been used by peri-urban farmers in Hubli-Dharwad for decades, especially during the rainy season, while liquid waste is the preferable option during the dry season (R7099, Phase 1 Report). Municipal solid waste is collected from street bins and markets or purchased from the municipal dumpsite and subsequently sold informally to peri-urban farmers. Until recently, farmers and informal vendors had the opportunity to purchase waste at auctions from the municipal dumpsite. This affordable way to access urban waste has been discontinued due to staff shortages in the public sector (Nunan, 2000). When urban waste is accessed, particularly the poorer farmers have to apply the waste largely unsorted and with a low level of decomposition, whereas the wealthier cultivators can afford to either purchase better quality compost or employ labourers for the composting process on site (R7099, Phase 1 Report).

Like in Kolkata, peri-urban farmers in Kano have used urban waste in agriculture for centuries (Lewcock, 1995). The application of urban waste is one of the factors that led to enhanced productivity while maintaining the soil conditions (ibid.). Although the way in which this resource is accessed has changed over time, the demand for organic waste is still high, one reason being the better or similar quality compared to artificial fertilisers. The inadequacies of the waste collection system in Kano enable the waste to undergo an informal composting process before it is collected from the streets, providing the users with an unintentionally better product.

As was mentioned before, using urban waste for agricultural purposes has never been a tradition in Kumasi and is most probably the reason why people are reluctant to take up such practice. Kindness (1999) undertook a detailed study on the availability of different types of soil ameliorants from several types of waste in and around Kumasi. The study reveals that only a small fraction of these available resources are currently used. Large amounts of municipal waste generated in the city get simply transported to landfill sites and about 20 percent

remain uncollected. The organic content of this waste (The central market waste in Kumasi alone contains 80 percent organic material) has been lost. But using organic material as soil ameliorants is perceived as the least economic option with a higher risk of failure and has therefore not been pursued in the agricultural sector (Danso et al., 2002).

However, more recently it seems that some awareness raising and the promotion of local activities on the utility of certain types of waste have taken place in Kumasi as a measure to ease the problem of waste management. This has resulted in the increase of mushroom cultivation and grasscutter and rabbit rearing using waste products such as sawdust and animal droppings (R8090 FTR). The final waste products are subsequently used to enhance soil fertility. This has enhanced considerably backyard gardening in a number of peri-urban villages (ibid.). However, most traditional farmers still favour the application of chemical fertilisers.

In some cases, for example Kumasi and Kano, there is a limited use of urban livestock manure in peri-urban agriculture. However, the price to purchase and transport this resource has proven to be either too expensive in those places, or the increasing translocation of animal husbandry out of urban areas has led to this resource becoming less and less available (Lewcock, 1995; Aberra and King, 2005; Nunan, 2000).

The process of using solid and liquid waste is not only a concern of peri-urban farmers but also for other peri-urban dwellers involved in farming-related employment. This includes activities such as hand tillage of weeds, waste picking and sorting. These activities are in most cases carried out by the poorest and most vulnerable groups in the PUI (R2148 Visit Report). Many of the casual farming and farming-related jobs are carried out by women and children, enhancing their risk of exposure to a number of health hazards (R7867 Annex F; R70999 FTR). In Kolkata and Hubli-Dharwad, waste pickers do play an important role in the separation and composting of waste. In the latter case waste pickers were involved in formal municipal trials for waste separation at source and composting (R7099 Phase 1 Report). However, in most cases waste picking remains an informal activity. Waste pickers in Kumasi play only a marginal role, as they are merely involved in the collection of non-organic materials.

2) The challenges of using urban waste

By now, there is a lot of literature available outlining benefits and risks of using urban waste (see for example Furedy and Chowdhury, 1996), which are also outlined in the various NRSP reports consulted, and many authors are talking about the need to 'close the nutrient loop' (see for example Cofie et al., 2001). Overall, the fact that the use of both solid and liquid urban waste has generated a number of employment opportunities in all the cases looked at, is one reason why these systems should be sustained. In Kolkata, sewage has provided an invaluable input into the development of the East Kolkata Wetlands systems. Peri-

urban aquaculture alone 'sustains several thousand jobs in allied support activities' providing the city consumers with approximately 13,000 tons of fish every year (R7872 FTR, Annex C, Situation Analysis: 28; Annex A). Furthermore, in all cases but Kumasi, organic urban waste (liquid, solid or both) has been used traditionally for decades or, in some cases even centuries, in nearby natural resource based production systems and has proven to be an invaluable input into agriculture and aquaculture. Solid waste provides agricultural soil with a long-term input of nutrients while the use of sewage is an inexpensive way for farmers to irrigate their plots during the dry season. Yet, evidence on the ground shows that despite the numerous benefits, peri-urban farmers find it increasingly difficult to use urban waste to its maximum potential.

As these traditional practices have chiefly remained informal, peri-urban farmers possess limited knowledge and information about the risks associated with urban waste reuse practices. What is more, without the support by or incorporation into the formal system, their continued existence is more and more threatened, with the burden falling particularly on the poorer farmers and farming-related workers. With recent developments in Hubli-Dharward, small and marginal farmers depending on rain-fed agriculture find it increasingly difficult to cheaply access waste while wealthier farmers do have the financial means to continue benefiting from urban waste (Nunan, 2000). Some of the underlying causes driving up the price of urban waste in Hubli-Dharwad are illustrated in the box below and will be further elaborated in the following sections.

Factors rendering the use of urban waste in Hubli-Dharwad more expensive

- The rising proportion of inorganic matter in urban waste leads to higher expenses for transporting and sorting to gain the same amount of usable material.
- The municipality has stopped auctioning urban waste due to staff shortages. Farmers can still purchase waste from the municipality through individual arrangements, but at a higher price.
- Farmers experience increasing difficulties to employ labourers for waste separation as urban employment opportunities push up wages.
- A private sector composting scheme uses waste to produce good quality but expensive compost.

Source: Nunan (2000)

2A) Health impact of urban waste reuse

Using sewage for irrigation enables farmers to produce crops during the whole year. Both in Kano and Hubli-Dharwad, most sewage-bearing streams carry water all year round thus enabling farmers to cultivate their plots during the dry season and sell them at a higher wholesale price (R7876 FTR; Lewcock, 1995). However, since the water is heavily polluted with faecal matter and industrial pollutants, there are some risks attributed to its use. The application of sewage can contaminate agricultural products, externally and internally, with coliform bacteria and other pollutants, putting not only the farmers but also the consumers at risk when the produce is eaten raw. Due to its informal nature, most poor farmers lack proper protective equipment, resulting in diverse practices to

filter sewage, which in turn has an impact on the level of risk exposure by the farmers and farm workers. Farmers in Hubli-Dharwad have found disposable needles and syringes in the sewage canal, which are pumped on the fields if there is no filtration in place (R7867 FTR). Some can afford motorised pumps with filters, while the poorer ones have to fetch the water manually. There is generally a great uncertainty among farmers about the handling of liquid waste. Therefore, most of them are unaware of the fact that a certain degree of sewage treatment is required for specific crops in order to prevent a number of diseases (R7867 FTR). Or else, farmers are aware but can simply not afford to apply precautionary measures (Danso et al., 2002). What is more, informality can largely exclude these producers from formal market channels (e.g. in Dar es Salaam and Addis Ababa) and therefore their products do not undergo proper quality control and food safety checks (Guendel, 2002).

Although sewage can be advantageous due to its combined function of irrigating and fertilising plots at the same time, it can cause weed growth, soil sickness, i.e. decreasing soil porosity, and pest incidences. As a consequence, farmers in Hubli-Dharwad have increased the use of pesticides with twofold consequences. For one, it raises the number of farmers suffering from pesticide poisoning (Hunshal et al., 1997 cited in R7867 FTR). For another, it exposes farm workers, particularly women carrying out hand tillage of weeds not only to pathogens but also toxins and pesticides, with a risk of transferring them to family members when preparing food or accomplishing other household tasks. Furthermore, the use of pesticides leads to groundwater pollution (R7867 FTR) putting the community at large at risk. Kindness confirms in her report (1999) that the application of organic manure offers far more nutrients than artificial fertilisers and can in the long term reduce weed growth, erosion, pathogen growth and improve the soil structure. Peri-urban farmers, however, seem to be unaware and thus frequently resort to conventional methods because they do not know otherwise. In Kumasi, this has severe financial implications, as the cost of inorganic fertilisers has been growing. The decrease of soil fertility and weeds poses a rising problem for the city. It appears to be a common theme from all project reports consulted that inorganic fertilisers are not necessarily favoured but used because they are perceived as essential due to a lack of information and knowledge sharing on the use of organic waste (R7867 FTR, R6799 FTR, R7099 Phase 1 Report, R7872 FTR).

2B) The impact of increasing development and urbanisation on the use of urban waste

The availability of urban waste is not a factor that influences how much organic material is used. In Hubli-Dharwad, Kolkata and Kano it is rather the difficulty to access it, which makes it an unreliable source, especially for peri-urban poor farmers (R7099 Phase 1 Report; R7872 Annex C; Lewcock, 1995). This process is closely linked to the ever-increasing development and urbanisation of cities, which has not only an impact on the accessibility of waste but also on its quality, with a rising percentage of inorganic matter and pollutants. Subsequently, the

limited availability of waste has an impact on the livelihoods of those involved in transporting, sorting and applying the waste as it reduces their income.

It is not so much the cost to purchase the waste but rather associated factors that decrease the purchase and use of urban waste. Especially small and marginal farmers in Hubli-Dharwad, Kolkata and Kano loose out on the use of urban waste due to increasing costs, high levels of contamination and consequently growing time and expenses involved in transporting and sorting the waste (Nunan, 2000; R7872 FTR Annex C; R2148 Visit Report). Contrary to a few decades ago where farmers used to collect the waste themselves from the roads or landfill sites, waste is now mainly collected by public lorries. In order to obtain waste, farmers would pay the drivers informally. This is not a very reliable practice, because the inadequacies of the formal system render it more expensive and difficult for peri-urban farmers to obtain urban waste (Lewcock, 1995, Nunan, 2000). In addition, it means that the fees collected bypass the formal waste management system thus eliminating the possibility to use these funds to develop solutions benefiting both sides. In all cases there is still considerable demand for urban waste, however, costly transport together with a decline in quality renders urban waste a resource too expensive for peri-urban poor farmers. In Kolkata and Hubli-Dharwad, better quality compost gets directly transported to a composting plant. The competition from a private contractor makes it generally more difficult for peri-urban farmers to pay sufficiently to secure regular deliveries (R7822 FTR Annex C; Nunan, 2000). Furthermore, the rising percentage of non-organic matter in urban waste, caused by increasing urbanisation and industrial activities, renders compost financially non-viable for the poorer peri-urban farmers, both in Hubli-Dharwad and Kolkata (R7872 FTR Annex C; Nunan, 2000). In Hyderabad with the implementation of a large-scale composting plant the demand of waste decreased considerably; thus the plant has been replace with smaller units providing a cheaper product (Nunan, 2000). This experience, together with the development in the other case studies, show that it is in fact largely farmers with very limited resources that have been benefiting from the use of urban waste. Reducing the availability seriously impacts on the livelihoods of many farmers and consequently farming-related workers.

Separation at source could be considered a viable solution to obtain good quality urban waste. Survey's in Hubli-Dharwad confirm that some people are already separating organic waste at home mainly for their own use. However, Beale (1997, cited in Nunan, 2000) indicates that people in South Asia are often not prepared to handle or separate organic waste as it is considered a polluting activity and constitutes one of the factors that jeopardises the success of such schemes. This needs further investigation but generally suggests the need for awareness raising at household level in concert with financial incentives. Furthermore, the case of Kumasi demonstrates that introducing new practices to people apparently is a long process and has to be done gradually over time (R8090 FTR). Farmers in Kumasi are generally willing to apply urban waste but are reluctant to do so due to a number of restricting factors. Firstly, as organic farming is not a widely established and recognised practice in the area, both

among producers and consumers, there are too many uncertainties about the benefits of using urban waste and the risks associated with it (R6799 FTR). Secondly, leading on from the first point, farmers in Ghana feel that the relatively low economic gains from organic farming together with the elevated risks of failure do not justify a change (Danso et al., 2002).
Despite the arising problems with urban waste, wealthier farmers still find ways to purchase and use organic urban waste. But it is particularly the small farmers that increasingly lose out, because they lack the financial means. With continued urbanisation, peri-urban farmers, that might have traditionally secured urban waste without major assistance, are now increasingly dependent on formal support, especially the poor ones. Government priorities seem to lie elsewhere. In India and Nigeria for example the government is heavily subsidising chemical fertilisers instead of supporting waste re-use schemes (7872 FTR; Lewcock, 1995).

Increasing land speculation in the PUI is limiting the use of urban waste due to the decline of agricultural land (R6799 FTR). Ambiguous government regulations, as is the case in Kolkata, put the farming community at risk of losing their plots (R7872 FTR Annex C). Insecure land tenure prevents farmers from investing in the long-term productivity of the land and therefore switching from urban waste, a more and more unreliable source, to subsidised and thus cheaper chemical fertilisers (R7872 FTR Annex C). In Kumasi there also seems to be a fear of insecure land tenure that discourages poor peri-urban farmers to use organic waste, even if it is potentially an inexpensive solution, an issue that requires further investigation (R6799 FTR). As mentioned before, the declining access to urban waste constitutes a threat not only to farmers but also to the livelihood of others, in many cases women and children, engaged in waste-reuse and farm-related activities. With closer proximity to urban centres and the increasingly unreliable supply of urban waste, peri-urban inhabitants have to look for new sources of employment thus switching to non-land-based livelihoods (R7872; FTR R8090 revised research report 4).

3) The missing links between peri-urban usage of urban waste and urban waste management

It is a well-known fact that the management of liquid and solid waste in urban areas of developing countries is becoming increasingly difficult. Yet, there is hardly ever a link between the often traditional but still informal use of solid and liquid waste for peri-urban agriculture and the formal waste management system in urban areas. All the NRSP reports consulted and other articles that are drawing from the research confirm this by clearly pointing out the missing link between the processes of waste management and use of urban waste in peri-urban production systems.

What is often not recognised is that through the re-use of organic urban waste peri-urban farmers are currently contributing to solving the waste problem of urban areas informally and therefore are important stakeholders in urban waste

management. Instead, strategies by local authorities to deal with increasing amounts of urban waste in most cases bypass small peri-urban farmers and tend to orientate towards private sector involvement to supply better-income customers. The fact is that the growing market of private sector composting schemes sells a product that is unaffordable for poor farmers. This is creating competition over waste resources with small local farmers who compost themselves, even more so if the whole responsibility for waste collection and treatment is transferred to private contractors. The commercialisation of waste is a threat to small farmers and additionally conflicting environmentally as most of the produce is not sold locally but transported to areas farther away (Nunan, 2000; R7854 FTR).

At present, in all the cases studied, there is a lack of considering all the variables to measure costs and benefits of using urban waste. The contribution in terms of wastewater treatment made by the peri-urban fishponds in aquaculture and other environmental benefits are currently not taken into account (R7872 FTR). Such measures are contributing to decrease waste treatment costs (both liquid and solid) and the researchers of the Kolkata case go even as far as talking about farmers subsidising the disposal of both solid and liquid waste because of the large amounts of sewage and organic waste absorbed in the aquaculture and agricultural systems (R7872 FTR Annex C). Yet, there is no municipal support to tackle the problem of siltation, resulting in a decrease of wastewater reuse in the ponds (R7872 Annex C). The pond operators depend more and more on the collaboration of the public sector that is in charge of controlling and maintaining the siphons and valves to release the effluent (ibid.). Equally, in Kano, despite the fact that peri-urban farmers apply huge quantities of urban waste on their fields (up to 185 tons per season for certain farms), a considerable amount of waste that releases the pressure on dumping sites, this contribution is currently not formally acknowledged (R2148 Visit Report). Similar to the Indian and Nigerian cases, there are no signs that the formal system is trying to support practices of wastewater irrigation in Ghana. To the contrary, the Accra Metropolitan Assembly (AMA) has even enacted a law that prohibits irrigating crops with wastewater (Keraita et al., 2002). So far this act has rarely been enforced, but the few cases pursued had severe implications for the offenders.

Failure to acknowledge these links in the formal system hinder proper management and monitoring on both sides. Successful strategies require that the needs of all stakeholders are considered and that includes peri-urban farmers. But in all cases there seems to be lack of responsibility or capacity from the waste management team to intervene. There seems to be a general confusion with responsibilities of peri-urban areas due to the institutional fragmentation these areas are subjected to[2]. In Kano, for example, the jurisdiction for waste collection is different to the one in charge of the farmland areas. This is aggravated by the fact that local authorities are often too weak to even fulfil their obligations in the core of urban areas, which poses a serious obstacle to them expanding the area of operation to the PUI. This has not been

[2] For more information on this see Mattingly (1999) and Dávila (1999).

picked up in any of the other cases studied but would be worth investigating further.

Where inaction or opposing action by the government prevails, efforts to preserve urban waste as a valuable resource require joint action of the beneficiaries. However, only few of the cases show any evidence of small farmers' networks or cooperatives working on those issues, thus they largely work in isolation from each other (R8090 revised research report 4). Researchers in Kano recorded the existence of farmers associations that were set up to gain government support (R2148 Visit Report). Yet, they have not been used as a medium to improve farmers' access to urban waste and are anyway perceived as being largely ineffective. In Kolkata pond owners have formed a relationship in form of a network. This network has been an influential channel to stop the implementation of a sewage plant, which would have threatened the continuation of the East Kolkata Wetlands System (R7872 FTR Annex C). However, it needs to be recognised that the members are small in number and part of the wealthier income groups in Kolkata. Therefore it is unlikely that a possible network of peri-urban farmers, less wealthy and thus less influential, will have similar success.

Concluding remarks

The need for more research and documentation on urban waste markets is raised in various reports and a necessity in order to improve solid waste management and assist urban and peri-urban farmers (Nunan, 2000; Keraita et al., 2002). There are still too many uncertainties about how to handle urban waste safely and productively, thus much more information sharing on the positive and negative aspects of current practice is required. To be able to take into account and explore the links between waste management and peri-urban farming and to incorporate current informal and opportunistic practices into the formal system, this needs to be done in an integrated way. Demonstration projects, workshops and consultation can be valuable ways to demonstrate the usefulness of urban waste and eliminate the prejudice that some farmers have (R6799 FTR).

Policy-makers are often unaware of farmers' needs regarding urban waste and they furthermore are oblivious to the economic significance urban waste could have, not only for the farmers but for the city economy as a whole. This constitutes a wasted opportunity to support such practices to enhance the livelihoods of many peri-urban poor people and consequently contribute to poverty reduction overall. Further investigation on the issues above could bring more light into the traditional but informal practices of peri-urban farmers and enable to establish the needed links between urban waste generation and its reuse for a proper resource flow management – to stop thinking in boxes and start thinking in a chain or even cycle.

During the life of the NRSP, many conclusions that might have been synthesised from the studies of urban waste reuse it supported have been provided by other research. Indeed, in some cases, the evidence of NRSP projects is among the cited foundations for some of these conclusions. Nevertheless, there are several important and original points that the NRSP projects bring to the fore, ones that have crucial meaning for urban waste management and pro-poor policy, including policy associated with the circumstances of a peri-urban interface. Moreover, when taken together, these NRSP projects are rich in detail that illustrates just how urban waste reuse functions, the changes these functions can undergo, how some users benefit and others lose, and finally, how policy engages with these matters or fails to do so.

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