

A Not So Quiet Transport Revolution in Bangladesh:: A case study on rural motorized three-wheelers in Bangladesh

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Abstract

A rural transport revolution has taken place in Bangladesh that, till now has escaped international and even national notice. A massive national innovation system that has developed wholly outside government regulations and policies where locally manufactured motorized rickshaws and *tempos* or auto-rickshaws, numbering (author going out on a limb here) in the tens of thousands, has silently changed the face of rural road transportation in Bangladesh.

1. Introduction

Much has been written on the changes in urban transportation in Bangladesh. Much of it has been centered on the environmentally friendly, but traffic jam inducing peddle rickshaws with their wonderful art work with visages of glamorous movie stars, political icons and heroes. This moving canvas's appeal or mystique as Joanna Kirkpatrick, an American anthropologist puts it, is for "Conveying the dreams and desires of the man in the street". Many others have documented how the congestion and pollution from factory made auto-rickshaws (with smoky two-stroke engines) led to their controls and bans from the streets of Dhaka. This led to even more documentation on the introduction of new and newly converted cleaner 3-wheelers powered by CNG.

This cultural and academic fascination with urban transportation comes at the expense of much more far reaching and fascinating spread of rural transportation technologies and their impacts. One such technology is the urban rickshaw's country cousin, the flatbed rickshaw (*vanghadi*)¹ of rural Bangladesh numbering in the hundreds of thousands has little or no data on it. Another is the now ubiquitous Chinese two-wheel tractor² (power tiller) with a trailer attachment that probably numbers close to one hundred thousand. Little or no formal studies have looked at the widespread use and tremendous impact on the lives of the rural poor that these technologies have had. Yet a third rural transport technology coming in under the public radar, and the subject of this paper, is the stealthy, rural based, thoroughly unorthodox, locally manufactured, no two being the same, Chinese motorized IMTs or "*botbordi*". So named for the distinctive sound their single cylinder diesel engines makes. Their stealthiness, as compared to the *vanghadi* and the power tiller, stems from the fact that no government agency or international projects were ever involved in the promotion of these IMTs and that it apparently exists in contradiction to the traffic rules and regulations. Since there is only the author's own limited research during periodic visits studying the national innovation system, surrounding it, the facts are still sketchy and figures given here are best guesses.

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² Estimates of the numbers of two-wheel tractors, with its standard rotovator attachment, range from 300,000 to 500,000. This makes Bangladesh agriculturally the most mechanized nation in south Asia.

2. Background

At time of its independence some 30 years ago Bangladesh was considered a basket case in terms of development and poverty and even its viability as a state was questioned by many. Today, though poverty has not been eliminated, in comparison to many of its south Asian neighbors, it is on track for meeting its MDGs. In 2003, Bangladesh for the first time in its modern history became a net exporter of food. A vibrant export garment industry and large fields of recently discovered natural gas is helping, but what only a few know is that its agricultural and the concomitant rural-non-farm sectors (RNFS) are also growing vigorously, well surpassing its population growth rate. While agriculture growth rates are a respectable 2.5% the RNFS is growing at a very good clip of nearly 7%. In 2002, more than 50% of average rural farm families' income came from the RNFS. Two studies have credited this large RNFS growth rate to agricultural mechanization or the availability of power at the farm level mostly coming from the import of inexpensive diesel engines/irrigation pump-sets and 2-wheel tractors. These machineries are also being used for non-farm work such as transportation, milling, processing, and service industries and then support network of maintenance, repair and spare parts provision (Mandal 2003, Hossain, 2002).

The technological key to the success and widespread adoption of motorized three wheelers is this very inexpensive Chinese diesel engines³. Most estimates are that over 100,000 engines are brought in each year and put to myriad uses, but especially irrigation pump-sets, milling, and road and water ways transportation. Indeed, the beautiful site of sail boats on the rivers are nearly nor more, and are now replaced with country boats chugging with direct drive (no transmission) Chinese diesel engines. Though this "dieselization" of the rural areas has its detractors most Bangladeshis would argue that that annoying chug chug chugging sound interrupting your tranquil view of the Ganges is the sound of poverty and drudgery being eliminated. Besides the elimination of the beautiful sailboats they have also eliminated one of the worst forms of human labor that of barge pulling.

3. Discussion

Beginning over 10 years back with no support from any government or development sector, local workshops in Bangladesh began to experiment with motorizing the peddle *vanghadi*. Using the Chinese single cylinder diesel engines that power the half million shallow tube well pump sets and the 300,000+ two-wheel tractors, and thousands of river "country" boats and barges, they came up with simple and inexpensive designs that to any western automotive engineer would appear to be accidents waiting to happen, but that millions of Bangladeshis have come to rely on for their daily transportation needs. These rural based workshops later began to morph their motorized rickshaws into larger, more complicated and more expensive auto-rickshaws of various sizes and capacities.

These IMTs are generally multipurpose though some are singularly made as people movers or goods transporters. None of these IMTs are encumbered with any government registration or number plate and their drivers rarely have motor vehicle license of any kind. How can this be? A

³ A rule of thumb for understanding how inexpensive these engines are is 1000 taka (20USD) per HP.

case study from Dinajpur in northern Bangladesh is very instructive. In the mid-1990s the locally manufactured motorized rickshaw began to show its face in public. The benevolent traffic police in and around Dinajpur mostly turned a blind eye to these enterprising operators as long as they remained in the rural areas and did not come into the city. As their numbers and girth grew, so too their importance to the local economy, to where some years later their defacto presence was no longer questioned, at least by the rural inhabitants who came to rely on them for their daily transport needs. Yet, still moderately controlled by the traffic police they were kept out of the main bazaars and cities. Their increasing success and numbers began to economically threaten the local, legitimate public transport (mostly old buses). These interests were at first vigorously defended by public transport's local organizations or cartels. They reportedly hired goons and forced these IMTs off their rural routes. As the story goes, as time past and their numbers continued to grow, these IMTs owners organized themselves and through similar means forced their IMTs back on to the rural roads and highways. Somehow they coexist side by side today. Though no evidence to support the claim, the author feels these IMTs must have taken a substantial portion of the 0-15 kilometer client/passengers from the legitimate public transport.

4. Basic Designs

The designs are simple due to the fact that the rural workshops, with a stick welder, a drill press and in some cases a very old lathe, are presently not able to fabricate more complicate machinery. Concomitantly, the initial capital and running costs are kept to a minimum and may be the prime reason for the widespread success of these IMTs.

4.1 Motorized-Rickshaw Designs

The smaller motorized rickshaw IMTs have a 2.5 - 4 HP engines and feature a very simple "single speed" V-belt clutch/transmission where a foot peddle/lever with idler pulley slowly tightens or engages the belt to begin moving forward. There are no reverse gears provided. The frame surrounding and supporting the engine are made in local workshops. Many times the front forks are also manufactured locally as the factory rickshaw forks are not strong enough for increased speed and poor road condition. The remaining frame, axle, tires, etc. are the commercially available rickshaw frames and parts. The rear brake is a piece of 4 inch flat belt (normally to power threshers and mills) wrapped around a 5 inch hub fixed on the rear axle around the hub and connected and tightened by yet another foot peddle to provide friction for stopping. Many times the commercial rickshaw front-wheel brake is also provided. They normally can carry 200 - 300 kgs of cargo/passengers. Costs are reportedly under 500USD.



Figure One: Motorized rickshaw flatbed with 3.5 HP mover with 3 HP Chinese engine near Tongail bazaar



Figure Two: Motorized rickshaw people Chinese engine edge of Bheramara

4.2 Auto-Rickshaw Designs

The mid-size 3-wheeler IMTs are based on auto-rickshaw designs (also known as tempo or tempo taxi) but whose frames and bodies are locally manufactured. The engines are from 4-8 HP and have a similar belt transmission system but with heavier sometimes multiple V-belts. Many times these mid-size IMTs may have two clutch levers with two sizes of drive pulley/drive belts on the engine that provide the machine a first and second gear. The rear axles are of various sizes, can be from old Indian auto-rickshaws supplied from scrap yards, but with the planetary gears removed and a double chain or double belt pulley inserted in its place with a single drive axle/wheel. Tires and hubs are also from scrap yards. These IMTs will sometimes have leaf spring suspension but coil springs seem to be the main suspension system and very few may have shock absorbers. The size and capacity varies greatly in this category but a general rule of thumb is for every 1 HP you can carry 100 kgs. The brake system utilizes the Indian auto-rickshaw's axle's rear brakes and rarely features a front break. They generally have a small simple belt driven dynamo attached for headlamp/night time driving. This category or IMTs are the most numerous and author estimates there could be upwards of 10,000 or more on the roads around Bangladesh. Their cost range from 500-1000 USD.



Figure Three: Mid-Size 6HP IMT in farmers fields near Rajshahi



Figure Four: 5 HP People mover. Driver waiting for customers at Dasmile Bazaar, near Dinajpur

4.3 Heavy Duty Auto-Rickshaw Designs

Though in the beginning found in much fewer in numbers, in recent years the heavy duty 3-wheel IMTs are gaining popularity. They range from 8-12 HP. The one shown below, is a top-of-the-line model that uses a 12 HP Chinese diesel engine that is connected by three heavy V-belts to a heavy duty Japanese van's 5 speed clutch and transmission and dual wheel rear axle. An automobile battery/alternator charging system is belt driven from the engine and the IMT has two front headlights and rear running lights and brake lights. Its substantial main frame and front tire suspension is locally manufactured. The rear brakes are the Toyota's and there is no front brake. The steering assembly is also cobbled together from the Toyota's steering wheel and gear. Admittedly, this featured IMT is one of the most sophisticated that the author has seen but illustrates what is possible in many of these less sophisticated but highly motivated workshops. Prices range over 1000 USD.



Figure Five: Heavy duty 12 HP IMT near Bogra

5. Policy Implications

The most astounding characteristic of all these locally fabricated IMTs are their stealthy ability to remain hidden from official government, researcher, and international donor project radar screens. It is strange indeed that there could exist 20,000 or more IMTs, supported by an amazing national innovation system and apparently remain unregulated, unmonitored, unaccounted, and un-assessed. Yet, this is not the only blatant unorthodox and stealthy national innovation system. Elsewhere in Asia Starkey et. al. (2002) note:

In Southeast Asia local entrepreneurs make cheap small trucks using a diesel engine fitted into a scrap chassis. These are known as itaen (Thailand), koyun (Cambodia), and congong (Vietnam), which means “iron oxen,” the name first used for power tillers. They have few refinements (or safety features), and no two vehicles are identical. Some small workshops make more than 100 a year. Transport entrepreneurs generally operate them, carrying building materials, goods, and people in rural and periurban areas.

This author has seen similar unlicensed four-wheel iron oxen in India’s Uttar Pradesh and Bihar but cannot say how many might exist there.

Though not a locally made and not rural based IMT, Odeleye and Bartlett (2006) report on an unregulated national system in Nigeria of commercial motorcycle transport where:

... the national Transport Policy does not formally recognize the existence of commercial motorcycling, nor the complimentary role it plays as a feeder mode to the public transportation system in the country. The authorities rather regard commercial motorcycling as an aberration, although it does offer a complimentary role to public transport in most cities”

Similarly, in China there appears to be what must be termed due to the numbers an unorthodox IMT revolution taking place. Besides the rural workshops making “country” three and four wheelers, the factories there are also manufacturing motorcycle based three-wheelers and pickup trucks with a single cylinder diesel engines capable of only 50 kms per hour and costing a fraction of a conventional pickup truck. This “farm vehicle” market according to Sperling et. al. (2002) has:

Over 3 million Chinese Rural Vehicles (including factory and locally manufactured) were produced in China in 2002, three times that of conventional passenger cars. Yet these smaller, simpler, indigenous vehicles are virtually unknown outside China. The CRV industry is unusual in that it evolved largely outside the control of government regulation and policy, using local technology and resources. CRVs now consume one fourth of the diesel fuel in China and play an important role in rural development.

From all these accounts there apparently exists a world-wide multiple systems of unregulated, unmonitored, unaccounted, un-assessed, and therefore unorthodox IMTs, but that most probably led by highly motivated entrepreneurs operating outside the official transport sector.

6. Conclusion

Though apparently there are no formal studies conducted on the Bangladeshi phenomena, the sheer numbers of these IMTs and the author and his Bangladeshi colleagues' many observations suggests a tremendous and positive pro-poor and even pro-women outcomes via provision of "accessible" transportation services to the rural poor of Bangladesh and therefore screams loudly for a formal impact assessment to learn of the actual economic, poverty and equality outcomes so that they may be tested and duplicated elsewhere.

6.1 Why Awareness?

Others have asked why should we assume that the governments, international community and aid donors should have been aware of these unorthodox rural transport innovation systems? Several reasons come to mind. One is that any one any project attempting to intervene in rural transportation sector in Bangladesh (or Nigeria or China) will not be taking actual local conditions into account in their program planning and therefore their project will already start at a deficit or worse still, be irrelevant. Secondly, development practitioners need to look at such "spontaneous innovations" as places to start in program planning in rural development, not ignore or simply work separately along side them⁴. Applied researchers are of tremendous help here in identifying what is working, what is spontaneously occurring and then how it could be supported. Participatory development projects in the past have held a stakeholders analysis, but analyzing only after a program/project already started with its "pre- stakeholder analysis" targets firmly in place. What I and others are suggesting is that projects to become more "what's already working well out there, and how can we help it along" type projects (Biggs 2006).

6.2 Ethical Considerations

Additionally, there are ethical conundrums that these unorthodox systems present to the author and others. First is that simply by calling attention to these systems, bringing them out of the closet as this paper does, alerts the concerned authorities, or forces them to confront in and possibly attempt to shut down these wonderful and unregulated down. A second conundrum is, is it permissible for international staff, projects or programs officially condone and even attempt to replicate similar unorthodox "models" and unregulated national rural transport innovation system in other countries? This paper's "outing" of the unorthodox systems is done in the great hope that national governments will not only see the pro-poor benefits brought by such stealthy systems but that they will work to support and integrate them into their rural transport policies and schemes. A way to get governments to look kindly on these IMTs is to "accentuate the positive".

4 Another of the author's observations is that international projects/agencies is that many times they are aware of such situations / "spontaneous innovations" but since their projects did not generate them (and they therefore cannot take credit for them), they ignore them. This is especially so when it appears that it is a private sector innovation. e.g. the huge success of the Chinese two-wheel tractors in Bangladesh that has also gone relatively unnoticed and unsupported.

Stop referring to them as unorthodox and begin to refer to them as “positive deviancies” or something similar. Sternin (2003) defines PD as the behavioral difference that allows a person or group to overcome some adversity that harms people with the same resources who behave in conventionally expected ways. Conventionally expected ways in rural Bangladesh would be to wait on entrepreneurs or government to introduce “acceptable” motorized transportation that may never come.

As for the second conundrum, the author and his colleagues in the National Agricultural and Environmental Forum, Nepal with our limited resources are not waiting for entrepreneurs or government to provide acceptable means of transport (or formal impact assessment of the Bangladeshi system⁵). While we too have a problems with the circumventing of existing policy, traffic and probably safety regulations we note that the benefits currently out way these costs. This is probably the particular noteworthiness of these PD IMTs, while very dangerous. and have embarked on a program to promote these PD IMTs in Nepal. Though meeting very similar resistance that was found early on in Bangladesh, we are confident that the IMTs will bring similar benefits to the rural poor of Nepal. While we are still open to suggestions of transport technologies of similar capacity and price that would conform to traffic rules and regulations



Figure Six. NAEF’s Gaule Tempo or Village Auto Rickshaw on display and demonstration in Kathmandu

Acknowledgements

The author is indebted to Paul Starkey and Robert Bartlett for their review and critical insights on this paper.

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⁵ But having a gut feeling that the outcomes are very pro-poor.

organized by the CGIAR Systemwide Program on Participatory Research and Gender Analysis International Maize and Wheat Improvement Center (CIMMYT) on 19–21 October 2005 at CIMMYT Headquarters, Mexico

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