How to initiate communities in developing countries into self road maintenance

Comment initier les communautés dans les pays en développement en termes d'auto entretien des routes

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ABSTRACT

Conditions of rural roads in developing countries are generally poor, severely limiting people's access to local markets and basic social services (e.g. education and health care). Government services and resources cannot adequately cover the rural areas, therefore it is important for the rural people to put their own efforts to maintain parts of their roads as they wait for government support. To make the peoples' effort efficient and to promote their own road maintenance, a simple new design and construction method for all-weather rural roads using Do-nou has been developed and its effectiveness tested in a previous study. Do-nou is a Japanese term for soil bag and a traditional geotextile. In this paper, technical transfer approaches for the expansion, extension and rootage of Do-nou technology among the rural communities in developing countries has been established; four approaches in four countries have been proposed.

RÉSUMÉ

Conditions de routes rurales dans les pays en développement sont généralement pauvres, en limitant sévèrement l'accès des populations aux marchés locaux et des services sociaux de base (par exemple l'éducation et les soins de santé). Les services gouvernementaux et les ressources n'étant pas suffisantes pour couvrir les zones rurales, il est donc important pour les populations rurales à mettre leurs propres efforts pour maintenir une partie de leurs routes, ils attendent le soutien du gouvernement. Afin de rendre les peuples effort efficace et de promouvoir leur propre entretien des routes, un nouveau design et de la méthode de construction de tous les temps, les routes rurales en utilisant Do-nouveau a été développé et son efficacité testée dans une étude précédente. Do-nouveau est un terme japonais pour le sol et un sac traditionnel géotextile Dans ce document, le transfert de techniques d'approches pour l'expansion, l'extension et de Do-rootage nou technologie entre les communautés rurales dans les pays en développement a été établie;. Quatre approches dans quatre pays ont été proposées.

Keywords : poverty reduction, developing countries, rual access roads, trafficability, do-nou

1 INTRODUCTION

About 23 % of the people in the world are forced to live at a subsistence level on less than a dollar a day. Three of the forthes of the people are living in the rural area. The lack of accessibility of the rural access roads have been identified as one of the main causes of poverty to the rural people in developing countries. The poor trafficability of the roads (Figure 1) block the farmers to transport their products to the markets, therefore they can't get the income.

One solution to this problem is that the farmers along the road generate their consciousness to maintain their road by themselves and then conduct the road maintenance continuously. From this view point, the authours have developed the simple and effective road maintenance using Do-nou, which is Japanese term for soilbag, a traditional geotexitile (Kimura and Fukubayashi, 2007).

Figure 1. The poor traficability of the rural access road (Uganda)

At the next stage, to expand and settle this simple geotechnical technology among the communities in developing countries, the technology transfer motel have been studied. In this paper, the four appoaches in four countries have been proposed.

This is a challenge for poverty reduction as geotechnical engineers has been established through focused subject of study, relevant technological development, field demonstrations and knowledge extension/transfer.

2 ROAD MAINTENANCE USING DO-NOU

Road maintenance using Do-nou requires only the locally available material and labour based. The plactic bags for crops and fertilizer, which are produced even in the agricultural countries of the third world, has been utilized as Do-nou bags. The technology is so simple that it can be said as a first aid for the road rehabilitation. Actually the feasiblity and the efficiency of this methods have been demonstrated.

The case of the road maintenance conducted in Kenya is introduced. The road situation before the maintenance is shown in Figure 2. The width is 3.0 m and the longitudinal gradient is about 12 %. The main traffic are the bicycles, donkey carts and tractors. The amount of the tractors is less than 10 per day. The

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Figure 2. The condition of the rural access road (Kenya)

Figure 4. The condition of the road 6 month after maintaining

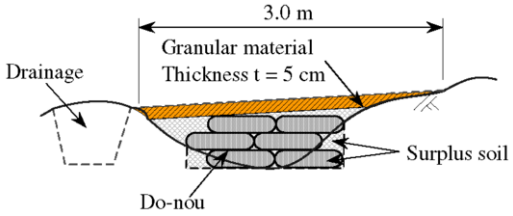

Figure 3. The cross section of the maintained road using Do-nou

Table 1. The data of the quantity survey to the road maintenance using Do-nou

Item	Unit price (US$)	Quantity per 100 m	Cost (US$)	%
Do-nou bags	0.2 / bag	500 bags	100	50
Gravel	2.4 / ton	22.5 ton	54	27
Tractor	11.2 / trip	4 trips	44.8	23
Total			198.8	100
Construction price per meter			2.0 US$	
Productivity per day (15 people, 7hours per day)			40 m	

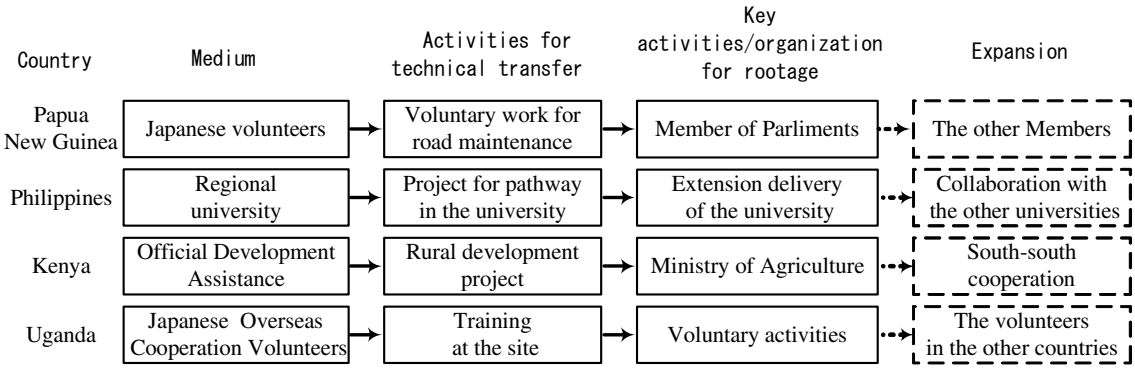

Figure 5. Four appoaches for the technical transfer

poor drainage causes erosion on the road. The galley was formed so deeply as to make even the donkey carts unable to pass the road.

This road was maintained as shown in Figure 3. At first the drainage was excavated on one side. Then the surplus soil was packed into the Do-nou bags. The do-nou were put in the space of the galley and well compacted manually. The roadbed was esbalished. The do-nou was covered with the granular material to make the cross slope to control the water to flow to the drainage. The thickness of the granular material was 5 cm.

The quantity survey is shown in Table 1. The construciton price is 2 US$ per meter of the road which width is 3 m.

The road condition six months later is shown in Figure 4. The rain water was controlled and flow in the drainage and the rut had not formed on the road surface. It was found that some of the covering granular material was washed away. To prevent the do-nou bags from being torn due to the friction from the tire of the passing car, the maintenance putting the extra granular material and compacting was required.

In a village, the farmers after training and demonstration on road maintenance with Do-nou, they went ahead and constructed a bridge across a river by themselves using log and Do-nou. It can be said that the road maintenance with Do-nou was so simple and effective that the farmers who participated in the construction were encouraged, motivated and felt owners of the road. This case indicates that the simple geotechnical technology contributes not only to keep the trafficability of the rural access roads but also encourage and motivate the people to improve the infrastructure around them by themselves. It possibly leads to the poverty reduction.

3 APPROACHES FOR TECHNICAL TRANSFER

Four approaches in four countries is summarized in Figure 5. In this paragraph the each approach is explained and discussed.

3.1 *Technical transfer through volunteer activities*

In Papua New Guinea, where it is said that more than 500 tribes are exisiting and the sense of public-service spirit among the people are low, the road maintenance using Do-nou technology is transferred to in the several villages through the voluntary works.

A Member of Parliment who allocated the budget for the community based, labour intensive rural road maintenance was

Figure 6. The construction situation in Papua New Guinea

Figure 7. The construction situation in the Philippines

often introduced in the news paper. In cooperation with the Japanese volunteer who lives as foreign resident, the road maintenance using Do-nou technology were introduced to him. He felt interested in not only the technology but also the concept for the self road maintenance and then provided the sites for demonstration.

3.1.1 *Results*

The community people participated in the road maintenance positively without any conflicts even though it was conducted except for the payment of the labour fee (Figure 6). The technology was accepted by them. 376 m of the rural roads in three villages were maintained for 12 days.

By combining the road maintenance using Do-nou technology with machinery technology (e.g. grading) which was funded by the Member of Parliment, the rural road was maintained totally.

Some farmers continue to maintain their road with Do-nou technology even after the civil engineers are gone.

There is the possibility that the management system is established which the Member of Parliment provides the material for road maintenance, for example do-nou bags and granular material, to the community and the people provide their labour.

3.1.2 *Challenges for the future*

Due to the traditional culture (e.g.mourning) and the political events (e.g.election), the road maintenance was often interrupted then some maintained part again became worse. It is difficult to force the people against their customs, but continuously make the advice for the road maintenance.

Now the road maintenance using Do-nou and our technical transfer activities are recognized by the communities which are struggling to keep the trafficability of the rural access roads. By responding to their demands, the technology is being expanded.

3.2 *Technical transfer cooperated with the regional university*

In the Philippines, the road maintenance using Do-nou technology and the case histories in Papua New Guinea were introduced at a regional university. At this moment the local NGOs near the university felt interested in the maintenance of the small-scale infrastructures using Do-nou technology.

This university is implementing some extension delivery approaches/projects which included training and continuing education, technology development. The university has strong connections with the NGO groups and the local government. Through the linkages of the university, the technology will be transferred to the rural area near the university.

To transfer the technology to the university, the project for raising of embankment of a pathway, which became submerged under water during rainy season was launched. To conduct the project on the initiatives of the university, a professor belonging to the international affairs was appointed as a coordinator of the project.

Figure 8. The pathway during the rainy season

3.2.1 *Results*

The authors supervised the construction on the first four days, then the technology was transferred to the civil engineers belonging to the university. After the authors were gone, they continued and completed the pathway, which was 55 m length and composed of 7,500 Do-nou.

The students participated in the construction as a part of a curriculum (Figure 7), therefore the labour fee was reduced.

This project was appealed to the NGOs and the local government.

On the initiative of the coordinator and the university, the project is extending to the other routes of the pathway and the small scale dam for fish pond.

3.2.2 *Challenges for the future*

Figure 8 shows the constructed pathway which kept the passable even during the rainy season. The university staff was so motivated to continue the maintenance with Do-nou. However, due to the lack of the funds the technology has not yet reached to the community near the university. By appealing the efficiency of the do-nou for the maintenance of the small-scale infrastructures to the local government or foreign donors, then they will get the money to conduct the project.

It is efficient to utilize the structure of the university because the staff has the expert experiences and scheme for the technical transfer. Now the other universities are being targeted.

3.3 *Technical transfer in the project for the rural development*

Under the rural development project conducted with the cooperation with Japanese and Kenyan government, the do-nou technology has been transferred to the target groups aiming to build the capacity of the rural community for keeping the rural

road passable annually in order that the farmers transport their products to the markets.

The Ministry of Agriculture in Kenya, the counterpart organization, has attached extension officers in the rural areas all over the country. Through their activities at their field, it is possible that the technology is transferred to the farmers. The demonstrations for the road maintenance using Do-nou have been implemented (Fukubayashi and Kimura, 2007).

3.3.1 *Results*

The efficiency of the road maintenance using Do-nou technology was demonstrated to both the counterparts and the implementing agency of the official development assistance.

The technology was transferred to the counterparts after the maintenance which length is 576 m. After that, the counterparts who were the horticulturalists conducted the rehabilitation of the road for 700 m with the community.

The other projects of the rural development implemented as an official development assistance requested the authors, geotechnical engineers to do the training for the road maintenance using Do-nou. The word of the Do-nou is recognized among the Ministry of Agriculture in Kenya.

3.3.2 *Challenges for futures*

It is difficult to respond to the request from the community people because the target areas in the project are fixed. Hereafter the road maintenance using Do-nou technology will be standardized in the Ministry of Agriculture, then the technology will take root. Further more, the technology will be expanded to other East African countries by promoting South-South cooperation.

3.4 *Technical transfer through the training to the Japanese Overseas Cooperation Volunteers*

As one of the official development assistance, Japanese government dispatches the Japanese overseas cooperation volunteers, who are 20 to 39 years old, to about the 80 countries in the third world. Some of them, who are with the arts background in many cases are sent as an extension officer to the rural area where mostly have the problem of the roads.

Once the volunteers master the road maintenance with Do-nou technology, they can transfer it to the people in need at the dispatched area and at the same time they can contribute to the improvement of their life.

To aim this, the training to the Japanese overseas cooperation volunteers was conducted in Uganda.

Figure 9 shows the plain view of Doho irrigation scheme where the training were conducted. The irrigation scheme has an area of 1,000 ha and was built with the donation from China. It used to be operated by government. In the scheme about 3,000 farmers grow rice, but they are not eager to maintain the road and the irrigation system because it used to be operated by government. The volunteers have activities to empower the irrigation association.

3.4.1 *Results*

The training to the 12 volunteers had been conducted for 3 days. The volunteers and the local farmers participated in the road construction then they mastered the procedure (Figure 10). About 100 m of the 1.5 km total length road was maintained during the training period.

After the 3 days training, the farmers were very eager to continue to the maintenance over the total length. In order to respond to their demand, the material fee and something drinking were provided to the dispatched volunteers by the author's NGO. They organized the farmers, then finally the total length of the road was maintained.

After the provided fund was run out, the farmers discussed how to get the material fee by themselves for the sustainable maintenance under the volunteers' guidance. As a result a road

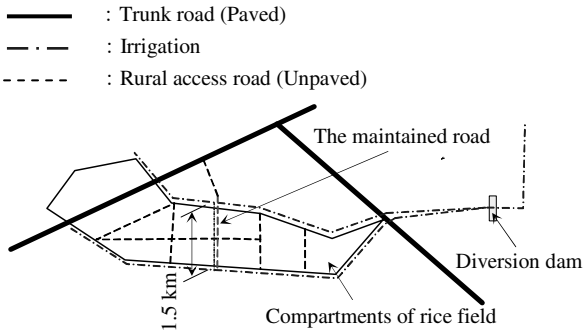

Figure 9. The plain view of the irrigation scheme

Figure 10. The farmers and volunteers who participated in the road maintenance

committee will be established and make the rule of the levy of toll, which is used for the maintenance of the road.

Some volunteers came back with the knowledge and implemented the road maintenance using Do-nou with the communities at their own dispatched area.

3.4.2 *Challenges for future*

The manual for road maintenance is required to assist the volunteers who are not the engineers. By doing the training to the volunteers in the other countries, the technology will expand to the wider range.

4 CONCLUSIONS

In this paper the transfer of the simple technology developed by the geotechnical engineers are discussed. The issues are that the technology takes root in the people and expanded efficiently. The four approaches have been implemented and have proved effective; local communities are gradually empowered to sustainably rehabilitate and maintain rural access roads.

The four approaches will be sustained and extended to the other countries. And the grass roots geotechnical cooperation will be implemented to aim to build the capacity of the people in order to maintain small-scale infrastructure by themselves.

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