

Tower Yarders, not Suitable to Japan? Technology Transfer is Still Going On

Arisa Matsuno¹, Koichiro Koike^{2*}

¹ Konan Nogyo High School

1839, Kusatsucho, 525 0036 Kusatsu, Japan

² Faculty of Life and Environment Sciences, Shimane University

1060, Nishikawatsu, 690 0823 Matsue, Japan

koikek@life.shimane-u.ac.jp

Abstract:

In Japan, almost all forests are in a steep slope. The conventional cable yarding system had been widely used all around. Although, this technology needs so many man power to install and remove cable networks. In the second half of the 1980s, introduction of tower yarders from Austrian and Norwegian manufacturer was tried. Tens of tower yarder were imported, and supply from domestic manufacturer also started. However, only few tower yarders of them are used now. The factor which has barred the introduction of tower yarders, considered to be an effective means to decrease the cost of timber, was examined from the natural, technical, and institutional viewpoints. Specifically, the condition of road network in Japan is not so poor as usually mentioned. As a result, for logging companies and the local governments, the knowledge about the function of tower yarder and the strategy of how to utilize is far from sufficient. For example, double remote control facility, for the winch and the carriage, is seldom known by Japanese foresters. Proposing some agenda to compensate these miscommunications.

Keywords: tower yarder, forest road, technology transfer

1 Introduction

It was hoped that the tower yarder played an active part in forestry activity in Japan with many steep terrain. The tower yarder used in Japan was produced in reference to a European or simply imported from Europe.

However, the tower yarder is not used broadly, and in these years has a tendency to decrease. Not all, but there were so many foresters, enthusiastically try to introduce tower yarders to Japan. But now few yarders only work.

There might be several reasons cable logging technology were not transferred well. To make it clear, try to reproduce what had happened in companies and cooperatives. Environmental acceptability is one of the criteria for assessing work efficiency of sustainable forest management. Environmentally acceptable timber harvesting is determined by procedures involving different machines and tools and adequate ways of timber processing, after which the damage to habitat (soil, water) and stand (standing trees, seedlings) are as low as possible. Due to an increasing influence of the public opinion on the current forest environment, the aesthetic appearance of the ongoing forest work site should also be taken into account as well as its appearance after the works have been completed.

2 A problem to be solved

If this subject had been clear enough, the logging cost would have been reduced significantly and Japanese forestry sector were competitive.

In Europe, especially in Austria, situations around tower yarders are put in order, for example by Heinemann and Stampfer, but in Japan, we have so many garbage of wires and gears, some of them are imported from Austria. Subsidized equipments should be fully used but actually not, then it becomes difficult to talk about mothballed yarders officially. Foresters, both in private sector and public sector, are

feeling something wrong with introduction process. It is not so comfortable to hear about failed investment. But compilation of failed procedure is, unfortunately not a sufficient condition, but a very critical, necessary condition itself.

3 Materials, methods and area of study

I investigated the possession situation of tower yarder in each prefecture by conduct a survey by a telephone, FAX and an E-mail to all (47) prefectural authorities. The document which we had collected is "Questionnaire concerning high-performance forestry machine" which prefectural authorities submitted to the Forestry Agency.

Then we performed hearing investigation for 12 business entities which had introduced tower yarders about actual introduction process of the tower yarder.

4 Introduction of tower yarder to Japan, actual status

4.1 Introduction of yarders and subsidy availability

Figure 1 shows manufacturer and the number of tower yarders in Japan. The number of 1 tower yarder as of 2007 was 169. The breakdown had five unknowns. Domestic tower yarder, a product made in Oikawa vehicle was 71 and was the first one, 47 which subsequently were made in Iwafuji.

In addition, nine made by Kawasaki Kikai 6 by Moritou, 5 by CKS, 3 by Mitsubishi and 2 By Kobelco respectively. The total number of tower yarder produced domestically was 143. The number of imported yarders was 21, 18 of them are made by Koller and 3 by Igland, Norway.

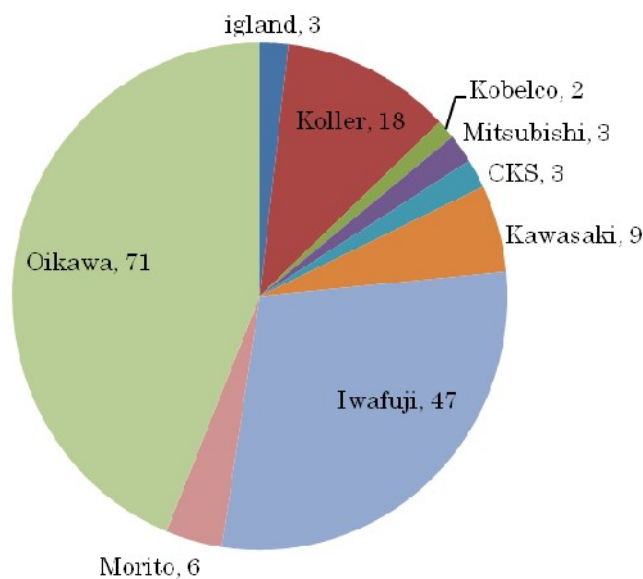


Figure 1: Tower yarders in Japan by manufacturers 2007 (these numbers are based on data from prefectural authorities)

The cabling system there are two kinds of systems. One is the running skyline method and the other is running skyline method.

In domestically produced tower yarder, 77 made by Oikawa and Morifuji were using Running Skyline method, and 66 by Iwafuji Kawasaki Kikai, CKS, Mitsubishi Heavy Industries and Kobelco were using Standing skyline methods. Within imported tower yarders, 18 is made by Koller Corporation, standing skyline method, while 3 tower yarders made by Igland using running skyline method.

About all 169, I show the rate of subsidies of the tower yarder purchase in figures 2 and 3.

The number that did not use a subsidy at all was 41 and if they were subsidized, the rate of subsidy was at least 33%. Among tower yarders which utilized subsidy, there were 43 with 33% subsidy and next 39 yarders were with 40% subsidy. In addition, 12 business entities purchased tower yarder with 100% subsidy.

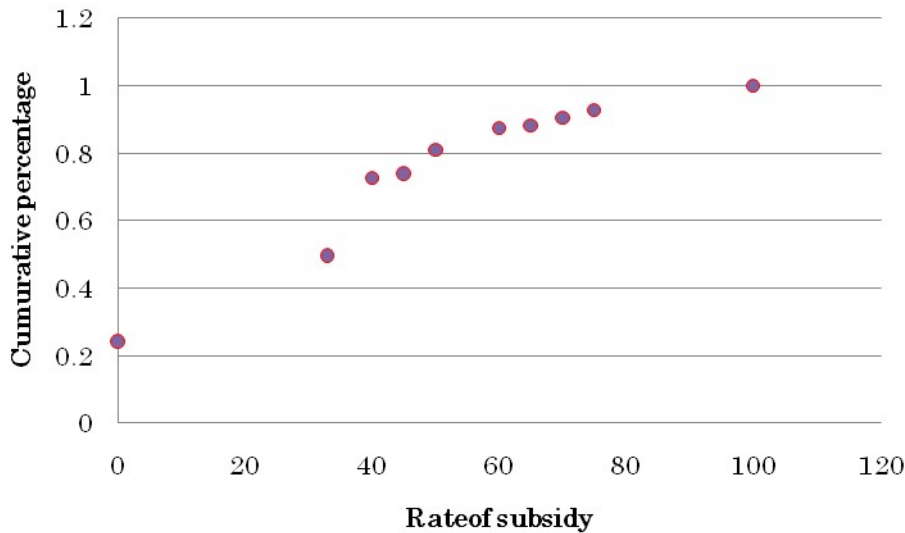


Figure 2: Cumulative percentage of subsidized level (these numbers are based on data from prefectural authorities)

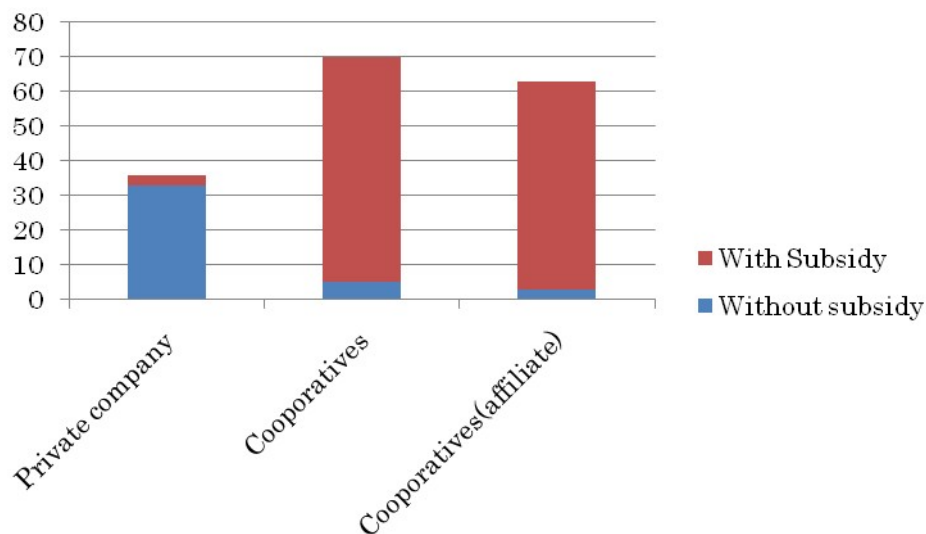


Figure 3: With/Without subsidy by type of entities (these numbers are based on data from prefectural authorities)

Figure 3 shows how they use subsidy according to the owners attributes. In case of private companies, only 3 yarders were purchased with yarders using a subsidy and 33 of them purchased without subsidy. By forestry owners' cooperative, 65 tower yarders were purchased using a subsidy. Only 5 were purchased without subsidy.

These tower yarders without subsidy which forestry owners' cooperatives were all second hand, definitely could not utilize subsidy. In affiliate companies purchased 60 yarders with subsidy and only three were without subsidy.

When compared the subsidy use of forestry owners' cooperatives with the private companies, the greater part of purchased by private companies were without subsidy, Contrary the greater part of yarders purchase by cooperatives were with subsidy.

4.2 Actual status of introduction and the results

Hereafter is the result of hearings from 12 companies which introduced tower yarders.

I show the operation situation of each business entity and supporting availability in table 1. As for the number of equipments, as for the breakdown of the model, TURMFALKE made by MAYR-MELNHOF Corporation K500 and K303 made by Koller, KTY600 by Kobelco, CKH-10500Z made by CKS, JUST tower made by Kawasaki Kikai. RME200T, RME300TC and RME300Tare made by Oikawa. Yarders are 16 in total.

Table 1: The rate of operation and subsidies (source: from 12 companies and cooperatives)

Entity	Type	Dom/Imp	Year	Working day		Subsidy
				Total	Average	
A	RME300T	Dom.	17	273	16	33
	RME300TC	Dom.	7	22	3	50
B	RME300TC	Dom.	1	80	60	50
C	RME300T	Dom.	4	90	23	50
D	RME300TC	Dom.	1	45	45	50
E	RME300TC	Dom.	1	30	30	50
F	RME300TC	Dom.	2	74	37	50
G	KTY600	Dom.	1	30	30	50
H	RME300T	Dom.	1	33	33	40
I	K303	Imp.	6	239	40	0
J	K303	Imp.	19	185	10	50
	K500	Imp.	13	185	14	75
	CKH-10500Z	Dom.	19	185	10	50
K	JUSTTOWER	Dom.	4	120	30	0
L	TULMFALKE	Imp.	4	unknown	unknown	0
	TULMFALKE	Imp.	10	unknown	unknown	0

Source: From 12 companies and cooperatives.

The number that purchased without subsidy was four of 16, and the rest 12 yarders were purchased with subsidy of 33%~75%.

In addition, the yearly average operation days of the tower yarder of each business entity were up to 60 days for three days at least. Normally the forestry machines such as other processors or harvesters works even at least for 100 days a year, it was revealed that the operation days of the tower yarder were very low.

Among business entities, tower yarder was used now in business entity A, Jand K. The operation situation of each list 7 business entity and supporting availability.

I show the criterion for selection of the introduction model and training for operation had been prepared or not in table 2.

As the criterion for selection, "a subsidy must be available" in 8 business entities out of the 12 business entity, 8 business entities introduced domestic produced tower yarder. In addition, one of the criterion f included what "setting up and dismantling is quick, and operation is and was easy to use" in 8 business entities. Business entity A, B, C, D, E and F, 6 among 8 business entities did not know the existence of TURMFALKE or K300 tower yarder.

Table 2: The criteria on introduction of tower yarders, trainings (source: from 12 companies and cooperatives)

Entity	Dom/Imp	The criteria on introduction	Training	Organized
A	Dom.	"Subsidy available"	x	Prefecture
B	Dom.	"Subsidy available"	x	Prefecture
C	Dom.	"Subsidy available"	x	Prefecture
D	Dom.	"Subsidy available"	x	Prefecture
E	Dom.	"Subsidy available"	x	Prefecture
F	Dom.	"Subsidy available"		
G	Dom.	"Subsidy available"		
H	Dom.	"Subsidy available"		
I	Imp.	"Tension, line velocity"		
J	Imp/Dom	"Tension, line velocity"	x	Pref./Company
K	Dom.	"Tension, line velocity"		
L	Imp.	"Tension, line velocity"	x	Company

Source: From 12 companies and cooperatives.

On the other hand, choice conditions included that "a function of tower yarder such as tension or the line velocity is very important" in business entity I, J and L these 3 business entities among 4 other business entities. Business entity J and L, 2 business entities among 3 business entities had been to Austria for inspection and grasped a function of the tower yarder. They have made a comparison between domestic and European yarders. They had made final selection based on the knowledge which they learned in Austria.

About having operation training or not, business entity A, B, C, D, E and J, 6 business entities among 12 business entities, participated in the training that prefectural authorities carried out. In training course for tower yarder operation, trainees were able to perform operation of the tower yarder once at least in three days, but it was 2~3 hours per person in total at the time when one operated it .Because operation time was so short, trainees often complained to extend training hours.

In addition, there was no additional course for specialized skills to operate more complicate function of these forestry machines. 6 other business entities did not have the training course. They learned from the business entity which introduced the same tower yarder or referred to a manual, Business entity J and L set up custom training course both in Austria and also in Japan.

Before having choice condition and operation training or not of the table 8 introduction model

I show findings about the function grasp situation of the tower yarder to table 3.

I divided the criteria of functions into two items, selection of the cabling system and tension / line velocity. As a result, about the cabling system, 8 business entities which introduced domestic produced tower yarder among 12 business entities had no interest on the cabling system itself. On the other hand, 4 business entities which introduced import tower yarders know the difference between these two ways of

cabling systems, and business entity J and L grasped the characteristics such as an advantage or the fault of each cabling system.

About tension and the line velocity, 8 business entities which introduced domestic produced tower yarder among 12 business entities knows only about their own yarders specification. Know almost nothing about other domestic and also all imported yarders.

On the other hand, 4 business entities which introduced import tower yarder grasp tension and line velocity of all domestic produced tower yarder. Business entity J and L also know tension and the line velocity of the import tower yarders.

In other words, for the business entity which introduced domestic tower yarders, they only know functions of their own yarders roughly. But business entities which introduced imported tower yarder grasped almost all functions of yarders, domestic and imported.

Table 3: Knowledge on functions of the tower yarder (source: from 12 companies and cooperatives)

Entity	Dom/Imp	Knowledge about functions			
		Cabling methods	Tension and velocity		
			Their own	Domestic	Imported
A	Dom.		x		
B	Dom.		x		
C	Dom.		x		
D	Dom.		x		
E	Dom.		x		
F	Dom.		x		
G	Dom.		x		
H	Dom.		x		
I	Imp.	x	x	x	
J	Imp/Dom	x*	x	x	x
K	Dom.	x	x	x	
L	Imp.	x*	x	x	x

Source: From 12 companies and cooperatives.

I show the reason to introduce tower yarders and the reason to stop operation in the field, business entity A, B, C, D, E, F, G and H, 8 business entities among 12 business entities introduced tower yarder which introduced domestic produced tower yarder into to table 4.

About the reason to introduce tower yarder, their answer are "tower yarders are prevailing in those days", or" neighboring business entities introduced domestic tower yarders"

In other words they didn't think of improvement of the productivity

In addition, about the reason that did not use the tower yarder, I included the reason "Logs are piled up in front of the tower yarder, and have to use another machine to remove them, and, as a result, have to pay personnel expenses."

Table 4: The reason to introduce and stop to use tower yarders

The reason to introduce	<p>"easier to set up and dismantle than drum yarder"</p> <p>"tower yarders are prevailing in those days"</p> <p>"neighboring business entities introduced domestic tower yarders"</p> <p>"Skidding by crawler type vehicle is impossible (topographical reason)"</p>
The reason to stop using	<p>"Logs are piled up in front of the tower yarder, and have to use another machine to remove them, and, as a result, have to pay personnel expenses."</p> <p>"difficult to secure logging volume"</p>

5 Discussion

5.1 Problems at the time of selection

As for the imported tower yarders, there was a problem to have time for operation and the construction removal work of the carriage by the radio control in an initial stage of the experimental introduction of TURMFALKE.

However, several years after the introduction of the imported tower yarders, the stable operation was enabled and continued to use them for ten years. This means that skills of operators improved and the maintenance system reliable.

From this, many logging companies including cooperatives evaluate these tower yarders, only by the information at the initial stage of the experimental introduction when each business entity examined the introduction of TURMFALKE.

In addition, in the hearing to the business entity which introduced domestic tower yarder, as for the introduction reason of the tower yarder, answers usually are "neighboring entities have purchased domestic machines" or "introduction of the tower yarder was prosperous in those days". These business entities grasped the function about their own machines only, and they did not grasp the productivity of tower yarders widely in use all over the world.

In other words, they did not choose tower yarders without considering improving the productivity significantly. From these results, in each business entity did not continue to collect technical information, and so they did not examine specifications of tower yarders and assumed logging operation enough.

Furthermore, the business entities which introduced domestic tower yarders did not spend so much effort to know functions and performance for productivity improvement as well as lack of intelligence activity.

In addition, one of the reasons why each business entity did not decide to buy TURMFALKE was simply "Its price was too expensive". About the purchase of the tower yarder, "the use of the subsidy was possible". As for the sum, the supporting upper limit by the central government was about one-third of total sum, and the assistance by prefectural expenses was also one-third, too. Therefore, a self-burden becomes approximately 15 million yen to purchase TURMFALKE of 50 million yen total, even if there were the assistance of both central and prefectural government.

By total amount It was almost same price purchasing a domestic produced tower yarder with self-pay.

By the business entity which introduced domestic tower yarder, in our hearing, the criteria of introduction is that, the tower yarder, was "subsidy must be available".

From this, subsidy promoted too easy introduction of tower yarders for the business entity.

5.2 Problems after the introduction of tower yarders

The business entity which introduced imported tower yarder set up training course in Austria, and also had their original training scheme in Japan. In case of Sumitomo Forestry, within several years, skills of workers and their maintenance scheme has been improved by the training, and became to know exactly functions and performance of tower yarders.

In other words, for a long term, they worked on technical improvement continuously.

On the other hand, the business entity which introduced domestic tower yarders participated only in the training that a prefecture authorities carried out, in operation training for only 2~3 hours, nevertheless, these courses did not correspond to further, specialized knowledge about functions and the performance of the tower yarder.

In addition, they grasped only rough functions of the company's own machine. So, in the training that prefecture authorities carried out, trainees could not get the knowledge of functions and the performance of tower yarders. These business entities participated only in the training that prefectural authorities carried out. Furthermore for some business entities, no training course had been considered.

From this, in the business entity which introduced tower yarder produced domestically, there was deficiency in the training system. For, they did not prepare training courses that they should perform for the improvement of skills of the engineer and the maintenance system.

5.3 To introduces tower yarders later on

At the choice of the tower yarder in each business entity, they did not know functions and the performance of the tower yarder, and so with "no idea" on the productivity.

From this viewpoint, it is important that we have to decide model specifications after having grasped a function and performance of the tower yarder enough. Each business entity itself must make decision with responsibility.

After the tower yarder introduction of each business entity, the essential training for engineers and the maintenance system improvement had seldom been carried out.

From this point, after tower yarder introduction, it is important that companies have to carry out training continuously so that engineers can fully exploit functions and performance of the tower yarder. In other words each business entity must train their engineers for productivity improvement.

6 Conclusions

There are not so much difference between Japan and Austria, as far as the possession structure of forest and the scale of logging. But, Austrian tower yarder was superior compared tension and line velocity of tower yarder developed in Austria with (Hayami et al. 1991) 25 years have passed from the first domestic tower yarder had released, as for the functions; tower yarder developed in Austria 20 years ago has higher functions than of Japanese tower Yarder today.

The difference is whether there is the structure that forest owners, forestry owners' cooperatives, wood consumers and machine manufacturer each, back up the system which profit improves by the mechanization.

For example, when "a logging company purchases a harvester, forest owners or forestry owners' cooperatives, will decide the annual logging volume and make a contract with this company, in consideration of the productivity improves". The contract becomes the security value again, and bank loan is expanded, and can purchase one more new machine.

As the annual income of a logging contractor increase and the forest owner can reduce cost of the business expense as much as productivity improved. (Hayami et al. 1991)

However, this system is not established in Japan.

Asking why you did not make a forestry machine to a forest machine manufacturer, the answer was that the market size of the forestry machine was too small, and profit was not expected. It is natural not to supply machines whose demand would fall short, because the machine development cost is company's burden.

In this study, we put a viewpoint on the consciousness side about the productivity improvement of each business entity. As a result, the business entity which introduced domestic tower yarder had not introduced tower yarders without being conscious to improve the productivity.

As for the cause that tower yarder did not spread out in Japan, the quality of the forest road network, the problem to secure volume of logging and various other might exist, as well as the consciousness of the business entity.

However, even if the improvement of the forest road network would be taken place, and the problem to secure volume of logging also solved, at first each business entity oneself has responsibility to make correct decision at the selection of equipment and apply actions to improve the productivity, the tower yarder will not be utilized widely.

7 References

Heinimann, H.R., Stampfer, K., Losehek, J., Caminada, L., 2001: Perspectives on Central European Cable Yarding Systems. In: Proceedings of the International Mountain Logging and North Pacific Northwest Skyline Symposium - A Forest Engineering Odyssey. CD Rom. Schiess and Krogstad (editors). December 10-12, 2001, Seattle, Washington, USA: 268-279.

Losehek, J., 2001: Development of mechanized logging. In Proc. Joint FS0/CEC/IL0 Workshop proceedings new trends in wood harvesting with cable systems for sustainable forest management in the mountains. Ossiach, Austria.

Toru, H., Koji, K., Nobuyuki, Y., Toshifumi, R., Masaki, M., 1991: An action to mechanization forestry, Forestry improvement spread library 106.