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Development of Small-Scale Fisheries

EXPERIENCES WITH MANUALLY OPERATED NET-BRAIDING MACHINE IN BANGLADESH

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EXPERIENCES WITH MANUALLY OPERATED NET-BRAIDING MACHINE IN BANGLADESH

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This paper documents the BOBP's experience with intermediate technology for net manufacture in Chittagong, Bangladesh. The intermediate technology tool was a manually operated net machine, originally of Japanese design but modified by a Bombay firm. It was hoped that the net machine could be operated by fisher-women to supplement family incomes and also increase the supply of gillnets.

The Bombay suppliers of the machine assisted in installing the manually operated machine in Bangladesh and in training fisherwomen to operate it. The machine was tried out at the CAR ITAS-supported Kalidaha Fishing Project near Chittagong from May 1982 to March 1984 and by a private entrepreneur from February 1985 to April 1986. A comparative study was carried out between the manually operated machine, hand-braiding of nets and industrial net-making. On behalf of the Directorate of Fisheries, Bangladesh, Mr. A Bashiruddin, Assistant Inspector of Fisheries, Chittagong supervised the trials. From the BOBP, Mr. G. Pajot, Senior Fishing Technologist, and Mr. A Kashem, Project Officer in Bangladesh, provided monitoring and coordination.

The trials were sponsored by the small-scale fisheries project of the Bay of Bengal Programme (BOBP). The project began in 1979. It is executed by the FAQ (Food and Agriculture Organization of the United Nations) and funded bySIDA (Swedish International Development Authority). The main goals of the project are to develop, demonstrate and promote appropriate technologies and methodologies to improve the conditions of small-scale fisherfolk in five countries bordering the Bay of Bengal — Bangladesh, India, Malaysia, Sri Lanka and Thailand.

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1. INTRODUCTION

The most common fishing gear in the Bay of Bengal region is the gillnet, usuaTly operated as driftnet. A large share of the total marine landings of fish is caught by these nets. In Bangladesh, the gillnets are operated from motorized as we!l as non-motorized traditional craft but the predominance of the gilinets over other fishing gear is even higher among the traditional craft. Gilinets of different mesh sizes with twines of different thicknesses and materials (nylon, tyre-cord, polyethylene etc.) are in use. Gillnets with mesh size 90—110 mm stretched mesh are used for catching pomfret, mackerel, catfish, hilsa etc. Large mesh gillnets of mesh size 180—200 mm stretched mesh are used to catch larger fish such as Indian salmon, jew fish, snapper, triple tail, catfish etc.

Gillnets are made locally, either by traditional hand-braiding or by automatic industrial machines. The twine for manufacture of nets is imported from countries like Japan, Korea and Taiwan.

In Sri Lanka, where approximately 60% of the marine landings is caught by gillnets, the shortage of fishing nets was identified as a major constraint to development in a review[1] of the small-scale fisheries situation in the country undertaken in 1976. The shortage was caused by the fact that the production of nets in Sri Lanka as well as their import had been low. The two net factories in the country catered only to about 25% of the demand.

In a survey of fishing net manufacture carried out two years later it was recognized that hand braiding of large mesh nets might be feasible on a cottage industry scale. Besides increasing the supply of large mesh nets the net making at cottage level would at the same time provide employment in fishing villages.

Against this background, BOBP initiated trials in 1979 with hand braiding of large mesh nets in a fishing community in Sri Lanka. However, the high labour costs of hand braiding of nets did not render it economically feasible as against the availability of cheaper machine-made nets. Also in the meantime, free import of netting material was permitted, and industrial net-making expanded.

In India gillnets were produced in sufficient quantity for the domestic market by hand-braiding as well as by automatic industrial machines. The main need therefore was to improve production efficiency and not to increase supply. It was concluded that hand-braiding of nets in its present form could hardly be better organised, its productivity could not be further improved.

It was felt that the main scope for significant development, through higher productivity or cheaper fishing nets, lay in an intermediate technology — such as a manually operated net machine — which could be used at a small-scale level or even at home during the spare time, by fisherfolk families. Since the hand-braided nets produced are of uneven quality, the possibility of improving the quality of nets through the manually operated net machine would further justify its introduction.

In the Bay of Bengal region, a manually operated net machine was considered most feasible in Bangladesh. This is because in the beginning of the 80s, machine net making was relatively less developed in Bangladesh, and labour cost was low. In 1982 (when the trials started) there were only two net-making factories in the country and a high percentage of the nets used by the small-scale sector were hand-braided. Besides the operation of set bagnets (behundi), gillnets are in use as the major traditional method of fishing in the estuarine and coastal waters •of Bangladesh.

Search for a manually operated net machine

One braiding machine that could possibly be used as intermediate technology for net making at cottage level was available with CIFT (Central Institute of Fishery Technology) in Cochin,

1Assessment of Problems and Needs in Marine Small-Scale Fisheries, Sri Lanka. RAS/74/031—WP 6, Colombo.

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India. The machine was inspected and found unfit to produce webbings of acceptable specifications and quality for fishing gear requiring good knot stability such as gillnets.

To obtain further information on intermediate net-making technology a wide-ranging enquiry was carried out during the second half of 1979. A large number of manufacturers of net making and rope making machines in Europe and Japan were contacted, as well as various fisheries research institutes and fisheries authorities. The response was rather discouraging. Although some information was received on existing manually operated net machines, none of them was considered suitable as intermediate technology at the cottage level. One manufacturer in Finland was planning, together with an Indian company, to introduce a semi-automatic net machine in India but this machine seemed to have little effect or bearing on the improvement of net making on a cottage scale.

The interest among manufacturers and technological institutes in the development and design of a manually operated net machine was also very limited. Two institutes in the United Kingdom showed some interest but nothing substantial emerged from the contacts.

In September 1981, a manually operated net-making machine which seemed suitable as an intermediate technology for net fabrication was identified. The net machine was produced by a firm in Bombay. It was originally manufactured by a company in Japan where it was in use at the cottage industry level. A few of these machines were imported by India in the '60s and subsequently manufactured in the '70s by the Indian manufacturer for his own net-making factory.

Objectives of the trials

It was decided that net-making trials should be carried out in Bangladesh, comparing the above type of manually operated machine with hand braiding and industrial net-making.

The objective of the trials has been to assess the technical and economic feasibility of the manually operated net machine in Bangladesh in comparison with hand braiding and fully automatic industrial net machines.

2. DESCRIPTION OF THE MANUALLY OPERATED NET MACHINE

The machine is simple, easy to operate and maintain. The moving parts are few and slow-running and the net machine can be operated by either men or women in 6—7 hour shifts. For using the net machine, pressure is applied on the pedal by foot for moving the twine from the steel bobbin in the lower hook. For releasing twine from the wooden bobbin for the upper hook the frame on top of the steel bobbin is pushed and drawn back by both hands. Then the lever for knot making is released by the left hand which also pushes the roller mechanically to roll the net.

The webbing is made in the direction perpendicular to the general course of the netting, therefore the netting stretches depthwise. The number of shuttles is 101, which means the maximum depth of the net produced is 100 meshes (200 knots).

For production of nets, a processing unit comprising a spool-winding machine, a stretching assembly and resining equipment is also required. All the components are manually operated. One processing unit can supply four manually operated net machines.

Cotton, nylon multifilament and polyethylene multifilament twines can be used for webbing but according to the manufacturer the machine performs best with multifilament nylon.

Nets of mesh sizes from 12 to 180 mm stretched mesh can be produced with twine sizes ranging from 210 denier 2 to210denier 18 or equivalent. Webbing produced are of the single weaver knot. (The manufacturer has recently modified the machine for fabricating webbing of double weaver knot).

The machine is shown in Appendix 1.

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3. TRIALS

The manually operated net machine has been tested during operation at the Kalidaha Fishing Project, Juldia (which is supported by CARITAS, a social welfare agency), and by a private entrepreneur at Patherghata, both in Chittagong.

3.1 Operation by Kalidaha Fishing Project

The Kalidaha Fishing Project (KFP) agreed to try out the manually operated net machine. Two machines and one unit of bobbin and spool winder and stretching assembly were provided by BOBP which also arranged for their transportation and installation at KFP. The installation was carried out by the supplier, Vijay Engineering Industries, Bombay. BOBP was also responsible for providing the required nylon twine; and for technical supervision and training of the operators through the manufacturer. KFP provided space for the machine and storage facilities for twine and produced nets. One person from KFP, deputed as supervisor, was made responsible for managing the trials. From the Directorate of Fisheries, an Assistant Inspector of Fisheries monitored the operation of the manually operated net machines and accessory equipment.

After the installation, operational tests were carried out by the supplier's technicians, and the operation started in May 1982. During the first three months the supervisor and ten operators (4 men and 6 women) were trained in the operation of the machines by an engineer and two technicians from the supplier firm. The supervisor was also given training in assembly installation and repair of the machines.

The trainees were grouped into two shifts, each shift lasting six hours. On completion of the training the four best female operators were selected for continued net fabrication.

Semi-commercial operation of the machines was carried out continuously from August to October 1982 and periodically from November 1982 until April 1983, when the production was stopped owing to problems in disposing of the nets. Pending transfer of the machines, they were operated for five weeks during February-March 1984.

Production data from the machines were recorded by the supervisor. Recorded data are however not available for the period November 1982 to April 1983.

Most of the nets produced were tested in fishing operation by boats belonging to the KFP. Other nets sold to private fishermen were checked continuously over several fishing trips.

The KFP trials were terminated in March 1984. It was concluded that operation on a commercial basis could not be established within the project owing to deficiency in management, supervision and marketing of the nets.

3.2 Operation by a private entrepreneur

Efforts were made since 1983 to identify a suitable private entrepreneur to operate the machines on a commercial basis. This was particularly important, because the KFP trials had shown that good management and supervision were needed to make the production economically viable.

Transfer of the machines to a building at Patherghata in Chittagong for commercial production of nets was arranged in November 1984 through a private entrepreneur. An owner of fishing boats, the entrepreneur had used some of the nets produced by the manually operated machines at Kalidaha and was interested in taking over the net production.

The entrepreneur undertook to operate the machines and provide the project with data on the output, costs and earnings and other information from the operation. BOBP provided supervisory services in assisting the entrepreneur in installing the machines and producing the nets during the initial period.

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The machines and all accessories were installed in the building at Patherghata in January 1985.

The supervisor from the Kalidaha trials was supposed to supervise the operation at Patherghata also. Since he did not prove to be reliable, a new supervisor was identified and he attended seven weeks' training in April-June with the Indian manufacturer, in erection, operation and maintenance of the machine and its accessories.

Training of new operators was organized and carried out by the supervisor. A number of batches of two women each were trained during August 1985— March 1986 for commercial production of nets on a daily six hour shift. For various reasons none of the women showed interest in continuing to operate the machines on a regular basis.

One of the two machines was operated commercially from August 1985 to April 1986. The second machine was used mostly for training purposes. During September and October 1985, both the machines were in operation; two of the trained women took part in commercial production of nets.

Data from the operation was recorded by the supervisor. The operation was monitored by the Assistant Inspector of Fisheries who had performed the same task earlier at the KFP.

The nets were used and tested on the entrepreneur's (own) fishing boats and also sold to other private fishermen.

4. RESULTS

Production Speed (Output)

In operating the manually operated net machines, nylon multifilament twine was used exclu-sively as per the recommendation of the manufacturer of the **machines. The width of the webbing** produced was 100 meshes. All nets fabricated were gillnets for Hilsa with mesh size 100 mm stretched mesh.

At the *Kafid3ha Fishing Project* only twine size 6 (210 denier/6) was used in the fabrication. The production results are presented in the table below (two net machines each with two 6 hour shifts per day.)

Month	Hours of operation	Knot produced* (length)	Knots/hour
August1982	522	100 482	192
September 1982	574	134 620	235
October1982	528	141 384	268
February 1984	105	27 450	261
March 1984	212	68 842	325

The production speed of the operators picked up considerably during the three-month period August to October 1982 from 192 to 268 knots per hour. The production speed rose further during the period February— March 198.. with a recorded average of 325 knots per hour in March.

Recorded production data from November 1982 to April 1983 are not available, but it is known that the production output by the end of the period exceeded 300 knots per hour.

*2Knots=1 mesh. Width of webbing 200 knots (100 meshes)

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During the period of commercial operation by the *private entrepreneur* at Patherghata, August 1985 April 1986, nets with twine size 6,9 and 12 (210 denier/6,9,12) were produced. The results are presented separately for the supervisor (one net machine, one shift 4—6 hours per day) and the two female operators (two net machines, operating shifts of 6 hours per day).

Twine size 6

Operator: Supervisor

Month	Hours of operation	Knots produced (length)	Knots/hour
August1985	55	18 100	329
November 1985	99	41 100	415
December 1985	2	850	425

Operators: 2 female operators

Month	Hours of operation	Knots produced (length)	Knots/hour
September 1985	334	84 100	251
October1985	111	23 050	208

Twine size 9

Operator: Supervisor

Month	Hours of operation	Knots produced (length)	Knots/hour
January1986	75	13 400	179
February 1986	133	31 450	236
March 1986	108	24 550	227
April 1 986	30	7 330	247

Twine size 12

Operator: Supervisor

Month	Hours of operation	Knots produced (length)	Knots/hour
October1985	86	26 000	302
November 1985	44	12 850	292

The supervisor who was trained by the manufacturer in Bombay achieved during the intial month an output of more than 300 knots per hour with twine size 6. The output increased further with time and later exceeded 400 knots per hour. The two female operators who had been trained by the supervisor produced between 200 to 250 knots per hour with the same twine size. This is comparable with the output that was recorded for the women operating the net machines during the initial trial period at Kalidaha.

For twine size 9 the output increased from about 180 knots per hour during the initial month to almost 250 knots per hour four months later. The lower output in terms of number of knots per hour compared to twine size 6 can be explained by the fact that the steel bobbins have to be changed more often, because as twine size increases, less twine can be wound on each of the bobbins.

This, however, cannot explain why the production output achieved for twine size 12 is higher than for twine size 9. The reason for the comparatively high production speed for twine size 12 is probably that a client ordered this particular type of net and the entrepreneur was requested to produce and deliver the net within a certain period of time. According to the operator, a number of hours of "extra duty" have not been recorded during the production of this net. For that reason, estimates of the "non-recorded" hours of operation have been included in figures presented above (22 hours in October 1985, 12 hours in November 1985). Taking into account the production results of webbings with twine size 6 at both Kalidaha and Patherghata, one can conclude that production output increases with time as more experience and operational skills are gained in operating the net machine. It seems possible to increase the initiallyachieved output of 200—250 knots per hour to 400 knots per hour — and even above 400 knots per hour. The manufacturer claims that a speed of 500 knots/hour is obtainable.

Quality of nets

After the fabrication the webbings are mended, stretched and boiled to attain stable knots in the nets. At the KFP, the webbings were also treated chemically for knot binding at an initial stage. During tests on fishing trips, knot slippage was, however, observed and complaints were received from fishermen who had bought and used the nets. Since the machines can only produce webbings with single knots, the risk of knot slippage is higher on these nets, compared to webbings with double knots.

The main reasons for the occurrence of knot slippage were that stretching and boiling of webbings had not been carried out properly. Uneven pressure on the machine handle during production might also be a reason for knot slippage in some cases.

Various measures were taken to solve the problem of knot slippage during the trials at Kalidaha. Finally stable knots were produced by a process of stretching and boiling the webbing in water without using any chemicals. The webbings produced were of acceptable quality for gill nets.

Assessment of the net machine

The net machines as well as the accessories have been operated without any major technical problems. Only a few minor repairs and adjustments have been necessary. All repairs could be attended to by local workshops. Lack of some basic and essential spare parts such as cog wheel hampered the operation occasionally. Good supply of spare parts is therefore necessary. The net machines seem to be easy to operate and maintain.

Training and skill

The operation of the net machine does not require any specific skill but instruction and training in operating of the machine over a period of at least two months seem necessary to achieve good production results and to learn in detail the whole production process. However, only a few days of initial instruction and training are needed before the trainee is able to operate the machine. In order to achieve a high output and good webbing quality, concentration, discipline, accuracy and patience were found to be important. The operators must also be able to cope with the monotony and the physical strain the work entailed.

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Management and supervision

To successfully operate the net machines on a commercial basis, good management is required. Though operating the machine is simple, strict supervision is needed to ensure high webbing quality. Also the stretching and boiling of the nets need careful supervision. The results indicate that in addition to the supervisor and the operators, one person, assigned full time, is required for overall management of the production unit including procurement of twine, arrangements for repairs as well as marketing of the finished nets.

The private entrepreneur at Patherghata could not devote enough time to manage the net making operation because he was busy operating his gillnetters. The supervisor therefore had to attend to some management tasks and could not concentrate exclusively on supervising net fabrication.

For producing webbings, one full-time operator per machine per shift (6 hours) is required. For the winding of bobbins, and for the mending, stretching and boiling of nets, one full time assistant seems to be sufficient for two machines and one shift.

Marketing

The KFP fnced some problems in disposing of nets produced, because of the uneven quality of the nets, slippage of knots and the fact that they were not equipped to undertake production and sales on a commercial basis. Another reason was the preference among many fishermen for nets made from tyre cord, a material which has not so far been successfully used on the machine, but is the most common twine material in hand-braided nets. Most of the nets produced at KFP were however used on their own fishing boats.

The private entrepreneur at Pathorghata reported that he had no major problems in disposing of the nets. Some of the private fishermen who had bought and used the nets had complained about the quality (slipping of knots), but no nets had been returned to the entrepreneur. A limitation he faced in the marketing was that the delivery time was much longer for the finished nets, owing to lower production speed as compared to nets produced by fully automatic industrial net machines.

5. COMPARATIVE STUDY

In the study, which should be seen as indicative, comparison is made of production output and cost between net fabrication by hand-operated net machine, automatic industrial machine and hand braiding.

The study has been limited to production of gillnets with nylon twine (210 denier 6) mesh size 100 mm, since this is the only type of net that has been produced on the manually operated net machine in a quantity that makes comparison with other fabrication methods meaningful. However, since hand-braided nets are now produced almost exclusively with tyre cord, only estimates of the production output and fabrication cost for hand-braided nets of nylon twine have to be used.

Hand-braiding

Information on fabrication time and costs for hand-braided gillnets has been gathered from four villages — North Madrasha, Eochia, Sonakania, and Chiuapara in Satkania area, 70 km south of Chittagong. Satkania is the centre for hand-braiding in this region, and hand-braiding is practised in many villages of the area. It is mostly women who are engaged in hand-braiding gillnets. It is possible for the women to combine hand-braiding with other daily tasks in the family. Therefore, only a few hours effective time per day is used for net fabrication. This explains the willingness of women to accept the very low payment they obtain for hand-braiding (Tk 1.75 per hour). Hand-braiding is often the only employment opportunity accessible to women in these villages and offers their families an extra source of income.

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Earlier, nylon twine was used for hand-braiding but after cheap (rejected) tyre cord was introduced in 1982, the latter material has become predominant in the production of hand-braided gillnets, mainly for inshore fisheries. Today, hand-braided nets in the Chittagong area are produced almost exclusively with tyre cord. Many fishermen prefer tyre cord nets to nylon nets for their superior durability. The tyre cord is waxed and hand twisted and the nets are not more expensive than those made of nylon.

The twine is provided to the hand-braiders by contractors who later collect the finished nets. All nets produced in the four villages where information was collected were hilsa gillnets, mesh size 100 mm with double knot. The prevailing prices paid to the women were Taka 40 per seer* (19.5 Tk/lb) for tyre cord nets and 1k 50 per seer (24.4 Tk/lb) for nylon nets. On an average the production time per pound of tyre cord net was 11 .1 hours. Since the weight ratio between nylon and tyre cord is approximately 3 : 4 the estimated production time per pound nylon net is 14.8 hours (=fabrication of 0.07 lb/hour).

Automatic industrial net machines

At present there are 12 industrial net factories in Bangladesh. Most of these have been established during the last few years. Four of the factories are located in Chittagong, which is the main net producing region in the country.

The calculation of output and costs of production by automatic industrial net machines is based on data collected from the BFDC net factory at the fish harbour complex in Chittagong. This is one of the most modern net factories in Bangladesh; it commenced its operation in November 1985. The machines were imported from Japan and only nylon twine is used in the operation. Nets with twine sizes 210 denier/3, 6,9 and 12, mesh size 65—1 50 mm are produced. (The number of shuttles on various machines in the BFDC net factory ranges from about 200 to about 400.)

The calculated costs and output are based on actual production results and worked out for one, two and three shifts of 6 hours per day. For twine size six the average production is 6.50 lb/hr and the costs calculated at 35.9 1k/lb using one shift, 19.8 Tk/lb using two shifts and 14.4 Tk/lb using three shifts per day.

A breakdown of the production costs is presented in Appendix 2.

Manually operated net machine

The calculation of the cost of net production on the hand operated net making machine has been based on a production output of 380 knots per hour. Production costs have been calculated for operating the machine in one, two and three shifts of 6 hours per day, 280 days per year.

The production output is calculated at 1.50 lb/hr and the production cost at 33.9 Tk/lb, 21.6 Tk/lb and 17.5 Tk/lb, assuming one, two and three shifts respectively.

The cost analyses of the manually operated net machines are shown in Appendix 3.

Comparison

Production output and cost of the three different methods compare as follows:

	Hand braiding	Manually operated net machine	Automatic industrial machine
Production lb/hr	0.07	1.59	6.50
Production time, hrs/lb	14.8	0.63	0.15
Production time, ratio	96.1	4.1	1
Production cost, Tk/lb:			
One shift/day	24.4	33.86	35.90
Two shifts/day		21.59	19.80
Three shifts/day		17.50	14.44

* 1 Seer=2.05 lbs.

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The above table shows that the manually operated machine is less competitive, both in terms of production time and production costs, than the automatic industrial net machine, assuming more than one shift per day. The production cost is 10% higher (at two shifts) and production time is four times that of an automatic industrial net machine. Compared with hand-braiding, the production time is much less; further, the cost per unit is lower for nets produced on manually operated net machines at two shifts per day.

From the above analysis it seems that the manually operated net machine will not be able to compete with automatic industrial net machines, but only with hand-braiding especially in terms of production time. If a more commercial production unit of manually operated net machines could be established with proper management and better utilization of the equipment, these machines would be able to compete better with automatic machines in terms of production costs.

The justification of hand-braiding, in spite of its unfavourable ratios of production time as well as production cost — especially when compared with automatic industrial net machines — is that hand-braiding offers a flexible supplementary employment opportunity to women in the villages and that tyre cord nets, which are preferred by many fishermen, are produced only by hand-braiding. Although cheaper nets can be produced on the manually operated machine, operating the machine as a cottage industry cannot be justified on the same grounds as hand-braiding. Tyre cord has not so far been used successfully in manually operated machines; operating these machines isa full-time job.

6. CONCLUSIONS

An intermediate technology for fabricating nets exists in the form of a manually operated net machine, which serves as an alternative to hand-braiding and to automatic industrial net fabrication.

The manually operated net machine is technically feasible, and easy to operate and maintain. It necessitated only a few repairs during the trial period. The quality of the nets has been generally good, but proper attention has to be paid to supervising net fabrication as well as stretching and boiling nets to prevent knot slipping. The nets are superior to hand-braided nets in mesh uniformity. A limitation of the machine however is that only single knots can be produced while most of the nets today are produced with double knots*.

Cotton, nylon multifilament and polyethylene can be used for webbings, but the manually operated net machine performs better with nylon multifilament than with polyethylene multifilament. The net machine has not been successfully operated with tyre cord, which is today the most commonly used twine material in hand-braiding, preferred by many fishermen in Bangladesh.

Just a few days' instruction enables one to operate the machine. To achieve good production results a training period of at least two months is required.

The production speed increases over time as more experience and operational skill are gained. An average output of more than 400 knots/hour can be attained by a skilled operator.

Good management, including efficient utilization of the equipment, procurement of twine and marketing of the finished products is essential for successful commercial operation of the net machine.

On the basis of the results from the trials, it seems that there is little scope for the manually operated net machine to compete with automatic industrial net machines in terms of fabrication cost and speed. A fully commercial production unit of manually operated net machines with more than one shift per day, has, however not been established as yet.

* Since the trials started, the manufacturer (Vijay Engineering Industries, 75, Shahid Bhagat Singli Road, Colaba, Bombay 400 005) has modified the machine so that it can produce double wcavrr knots.

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The manually operated net machine is able to compete favourably with hand-braiding — particularly in terms of fabrication time and fabrication cost. However, if introduced at a cottage level, the net machine cannot provide the same flexible and supplementary employment opportunity for village women as is possible with hand-braiding, since the manually operated net machine requires full time employment of labour. For a person interested in full-time labour, other employment opportunities seem to be more attractive — in urban factories, for example. This may be attributed to the monotony and the physical strain associated with operation of the net machine, together with a lack of faith that operating the machine will offer regular employment.

Future potential for large-scale use for an intermediate technology such as a manually operated net machine must be considered limited, since a number of fully automatic industrial net machines' which can produce low cost nets at high speed, have been set up in the region.

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Appendix 1

MANUALLY OPERATED NET MACHINE

Specifications:

Knots	Single weaver
Number of shuttles	101
Bobbin diameter (mm)	100
Weight (kg)	480
Dimensions: (m)	
Length	1.5
Width	1.0
Height	1.5

The manually operated net-braiding machine, in use at Chittaç/ong

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Appendix 2

PRODUCTION COST OF NETS BY AUTOMATIC INDUSTRIAL NET MACHINES AT BFDC NET FACTORY FISH HARBOUR, CHITTAGONG

Average cost of production per hour per machine of nets, twine sizes 3—12 (210 denier 3—12), mesh size 65—150 mm (stretched mesh). Tk

		1 shift of 6 hrs/day	2 shifts of 6 hrs/day	3 shifts of 6 hrs/day
Electricity and maintenance		9.94	9.94	9.94
Salary—staff		14.13	14.13	14.13
Operator	5.55			
Factory boy	4.29			
Mender	4.29			
Administrative overheads		7.98	3.99	2.66
Sub-total		32.05	28.06	26.73
Depreciation 10% and interest 12% (in equal yearly instalments)		190.10	95.05	63.37
Factory overheads (headquarters)		11.20	5.60	3.73
Total		233.35	128.71	93.83

For twine size 6 (mesh size 65—150 mm) the average production is 6.50 lb/hr which gives a cost of production of 35.90 Tk/lb based on 1 shift operated, 19.80 1k/lb based on 2 shifts and 14.44 Tk/lb based on 3 shifts.

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Appendix 3

PRODUCTION COST OF NETS BY MANUALLY OPERATED NET MACHINE

Based on operation of a unit consisting of two net machines.

Production

380 knots/hr x 6 hours/day x 280 days/year × 2 net machines= 1276 800 knots—5276 lbs/year per shift.

Investment	**Total costs (Tk)**
2 net machines at Tk 178 000 each	356 000
Accessories, one unit at Tk 74 000 per four net machines	37 000
Total	393 000

Cost of production	Annual cost (Tk)	Cost per lb 1 shift	2 shifts	3 shifts
Fixed cost				
One manager Tk 2500/month	30 000	5.69	2.84	1.90
One supervisor Tk 1500/month	18 000	3.41	1.71	1.14
Rent of building	12 000	2. 27	1.14	0.76
Depreciation, 10% and interest 12% (in equal yearly instalments)	69 560	13.18	6.59	4.39
Sub-total	129 560	24.55	12.28	8.19
Variable cost (per shift)				
Two operators at Tk 1200/month	28 800	5.39	5.39	5.39
One assistant, Tk 1000/month	12 000	2.24	2.24	2.24
Repair, electricity, kerosene detergent soap	9 000	1.68	1.68	1.68
Sub-total	49 800	9.31	9.31	9.31
Total Tk	179 360	33.86	21.59	17.50

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Publications of the Bay of Bengal Programme (BOBP)

The BOBP brings out six types of publications:

Reports (BOBP/REP/. . . .) describe and analyze completed activities such as seminars, annual meetings of BOBP's Advisory Committee, and projects in member-countries for which BOBP inputs have ended.

Working Papers (BOBP/WP/...) are progress reports that discuss the findings of ongoirsg BOBP work.

Manuals and Guides (BOBP/MAG/. . .) are instructional documents for specific audiences.

Miscellaneous Papers (BOBP/MIS/. . .) concern work not originated by BOBP — but which is relevant to the Programme's objectives.

Information Documents (BOBP/INF. . .) are bibliographies and descriptive documents on the fisheries of member-countries in the region.

,Vewsletters (Bay of Bengal News), issued quarterly, contain illustrated articles and features in non-technical style on BOBP work and related subjects.

A list of publications follows.

Reports (BOBP/REP/...)

1. Report of the First Meeting of the Advisory Committee. Coloinbo, Sri Lanka, 28—29 October 1976. (Published as Appendix I of IOFC/DEV/78/44.l, FAQ, Rome, 1978)
2. Report of the Second Meeting of the Advisory Consmittce. Madras, India, 29—30 June 1977. (Published as Appendix 2 of IOFC/DEV/78/44.l, FAO, Rome, 1978)
3. Report of the Third Meeting of the Advisory Committee. Chittagong, B:sngladesh, 1—10 November 1978 Colombo, Sri Lanka, 1978. (Reissued Madras, India, September 1980)
4. Role of Women in Small-Scale Fisheries of the Bay of Bengal. Madras, India, October 1980.
5. Report of the Workshop on Social Feasibility in Small-Scale Fisheries Development. Madras, India, 3—B September 1979. Madras, India, April 1980.
6. Report of the Workshop on Extension Service Requirements in Small-Scale Fisheries. Colombo, Sri Lanka, 8—12 October 1979. Maclras, India, June 1980.
7. Report of the Fourth Meeting of the Advisory Committee. Phuket, Thailand, 2 7—30 November 1979. Madras, India, February 1980.
8. Pre-Feasibility Study of a Floating Fish Receiving and Distribution Unit for Dubla Char, Bangladesh. G. Eddie, M. T. Nathan. Madras, India, April 1900.
9. Report of the Training Course for Fish Marketing Personnel of Tamil Nadu. Madras, India, 3—14 December 1979. Madras, India, September 1980.

10.1 Report of the Consultation on Stock Assessment for Small-Scale Fisheries in the Bay of Bengal. Chittagong, Bangladesh, 16—21 june 1980. Volume 1: Proceedings. Madras, India, September 1980.

10.2 Report of the Consultation on Stock Assessment for Small-Scale Fisheries in the Bay of Bengal. Chittagong, Bangladesh, 16—21 June 1980. Volume 2: Papers. Madras, India, October 1980.

11. Report of the Fifth Meeting of the Advisory Committee. Penang, Malaysia, 4-7 November 1980. Madras, India, January 1981.
12. Report of the Training Course for Fish Marketing Personnel of Andhra Pradesh. Hyderabad, India, 11—26 November 1980. Madras, India, September 1981.
13. Report of the Sixth Meeting of the Advisory Committee. Colombo, Sri Lanka, 1—5 December 1981 Madras, India, February 1982.
14. Report of the First Phase of the "Aquaculture Demonstration for Small-Scale Fisheries Development Project" in Phang Nga Province, Thailand. Madras, India, March 1982.
15. Report of the Cortsultation-cum-Workshop on Development of Activities for Improvement of Coastal Fislsing Families. Dacca, Bangladesls, October 27—November 6, 1981. Madras, India, May 1982.
16. Report of the Seventh Meeting of the Advisory Committee. New Delhi, India, January 17—21, 1983. Madras, India, March 1983.
17. Report of Investigations to Improve the Kattumaram of India's East Coast. Maclras, India, july 1984.
18. Motorization of Country Craft, Bangladesh. Madras, India, July 1984.
19. Report of the Eighth Meeting of the Advisory Committee. Dhaka, Bangladesh, january 16—19, 1984. Madras, India, May 1984.

<<

20. Coastal Aquaculture Project for Shrimp and Finfish in Ban Merbok, Kedah, Malaysia. Madras, India, December 1984.

21. Income-Earning Activities for Women from Fishing Communities in Sri Lanka. Edeltraud Drewes. Madras, India, September 1985.

22. Report of the Ninth Meeting of the Advisory Committee. Bangkok, Thailand, February 25—26, 1985. Madras, India, May 1985.

23. Susmmary Report of BOBP Fishing Trials and Demersal Resources Studies in Sri Lanka. Madras, India, March 1986.

24. Fisherwomen's Activities in Bangladesh: A Participatory Approach to Development. Patchanee Natpracha. Madras, India, May 1986.

25. Attempts to Siimulate Development Activities in Fishing Communities of Adirampattinam, India. Patchanee Natpracha, V.L.C. Pietersz. Madras, India, May 1986.

26. Report of the Tenth Meeting of the Advisory Committee. Male, Maldives. 17—18 February 1986. Maclras, India, April 1986.

27. Activating Fisherwomen for Development through Trained Link Workers in Tamil Nadu, India. Edeltraud Drewes. Madras, India, May 1986.

28. Small-Scale Aquaculture Development Project in South Thailand: Results and Impact. E. Drewes. Madras, India, May 1986.

29. Towards Shared Learning: An Approach to Non-formal Adult Education for Marine Fisherfolk of Tamil Nadlu, India. L. S. Saraswathi and Patchanee Natprachma. Madras, India, July 1986.

30. Summary Report of Fishing Trials with Large-Mesh Driftnets in Bangladesh. Madras, India, May 1986.

31. In-Service Training Programme for Marine Fisheries Extension Officers of Orissa, India. U. Tietze. Madras, India, August 1986.

Working Papers (BOBPJ IVPJ. . .

1. Investment Reduction and Increase in Service Life of Kattumaram Logs. B.. Balan. Madras, India, February 1980.

2. Inventory of Kattumarams and their Fishing Gear in Andhra Pradesh and Tarnil Nadu. T. R. Menon. Madras, India, October 1900.

3. Improvement of Large-Mesh Driftnets for Small-Scale Fisheries in Sri Lanka. G. Pajot. Madras, India, June 1980.

4. Inboamil Motorisation of Small G.R.P. Boats in Sri Lanka. Madras, India, September 1980.

5. Improvement of Large-Mesh Driftnets for Small-Scale Fisheries in Bangladesh. G. Pajot. Madras, India, September 1980.

6. Fishing Trials with Bottom-Set Longhines in Sri Lanka. G. Pajot, K. T. Weerasooriya. Madras, India, September 1980.

7. Technical Trials of Bcachcraft Prototypes in India. 0. Gulbrandsen, G. P. Gowing, R. Ravikumar. Madras, India, October 1980.

.8. Current Knowledge of Fisheries Resources in the Shelf Area of the Bay of Bengal. B. T Antony Raja. Madras, India, September 1980.

9. Boatbuilding Materials for Small-Scale Fisheries in India. Madras, India, October 1980.

10. Fishing Trials with High-Opening Bottom Trawis in Tamil Nadu, India. G. Pajot, John Crockett. Madras, India, October 1980.

11. The Possibilities for Technical Cooperation between Developing Countries (TCDC) in Fisheries. E. H. Nichols. Madras, India, August 1981.

12. Trials in Bangladesh of Large-Mesh Driftnets of Light Construction. G. Pajot, T. K. Das. Madras, India, October 1981.

13. Trials of Two-Boat Bottom Trawling in Bangladesh. G. Pajot,J. Crockett. Madras, India, October 1982.

14. Three Fishing Villages in Tamil Nadu. Edeltraud Drewes. Madras, India, February 1982.

15. Pilot Survey of Driftnct Fisheries in Bangladesh. M. Bergstrom. Madras, India, May 1982.

16. Further Trials with Bottom Longlines in Sri Lanka. Madras, India, July 1982.

17. Exploration of the Possibilities of Coastal Aquaculture Development in Andhra Pradesh. Soleh Samsi, Sihar Siregar and Martono. Madras, India, September 1982.

18. Review of Brackishwater Aquaculture Development in Tamil Nadu. Kasem.sant Chalayondeja and Anant Saraya. Madras, India, August 1982.

19. Coastal Village Development in Four Fishing Communities of Adirampattinam, Tamil Nadus, India. F. W. Blase. Madras, India, December 1982.

<<

20. Further Trials of Mechanized Trawling for Food Fish in Tamil Nadu. G. Pajot, J. Crockett, S. Pandurangan, P. V. Ramamoorthy. Madras, India, December 1982.

21. Improved Deck Machinery and Layout for Small Coastal Trawlers. G. Pajot,J. Crockett, S. Pandurangan and P. V. Ramamoorthy. Madras, India, June 1983.

22. The Impact or Management Training on the Performance of Marketing Officers in State Fisheries Corporations. U. Tietze. Madras, India, June 1933.

23. Review of Experiences with and Present Knowledge about Fish Aggregating Devices. M. Bergstrom Madras, India, November 1983.

24. Traditional Marine Fishing Craft and Gear of Orissa. P. Mohapatra. Madras, India, April 1986.

25. Fishing Craft Development in Kerala: Evaluation Report. 0. Gulbrandsen. Madras, India, June 1984.

26. Commercial Evaluation of IND-l3 Beachcraft at Uppada, India. R. Ravikumar. Madras, India, June 1984.

27. Reducing Fuel Costs of Small Fishing Boats. 0. Gulbrandsen. Madras, India, July 1986.

28. Fishing Trials with Small-Mesh Driftnets in Bangladesh. G. Pajot and T. K. Das. Madras, India, March 1984.

29. Artisanal Marine Fisheries of Orissa: a Techno-Demographie Study. M. H. Kalavathy and U Tietze. Madras, India, December 1984.

30. Mackerels in the Malacca Straits. Colombo, Sri Lanka, February 1985.

31. Tuna Fishemy in the EEZs of India, Maldives and Sri Lanka. Colombo, Sri Lanka, February 1985.

32. Pen Culture of Shrimp in the Backwaters of Killai, Tamil Nadu: A Study of Techno-economic and Social Feasibility. Rathindra Nath Roy, Madras, India, January 1985.

33. Factors tlsat Influence the Role and Status of Fisherwomen. Karuna Anbarasan. Madras, India, April 1985.

34. Pilot Survey of Set Bagnet Fisheries of Bangladesh. Abul Kashent. Madras, India, August 1985.

35. Pen Culture of Shrimp in the Backwaters of Killai, Tamil Nadu. M. Karim and S. Victor Chandra Bose. Madras, India, May 1985.

36. Marine Fishery Resources of the Bay of Bengal. K. Sivasubramaniam. Colombo, Sri Lanka, October 1985..

37. A Review of the Biology and Fisheries of *Hilsa ilisha* in the Upper Bay of Bengal. B. T. Antony Raja. Colombo, Sri Lanka, October 1985.

38. Credit for Fisherfolk: The Experience in Adirampattinam, Tamil Nadu, India. R 5. Anbarasan and Ossie Fernandez. Madras, India, March 1986.

39. The Organization of Fish Marketing in Madras Fishing Harbour. M. H. Kalavatby. Madras, India, September 1985.

40. Promotion of Bottom Set Longlining in Sri Lanka. K. T. Weerasooriya, S. S. C. Pieris, M. Fonseka. Madras, India, August 1985.

41. The Demersal Fisheries of Sri Lanka. K. Sivasubramaniam and R. Maldeniya. Madras, India, December 1985.

42. Fish Trap Trials in Sri Lanka. (Based on a report by T. Hammerman). Madras, India, January 1986.

43. Demonstration .d Simple Hatchery Technology for Prawns in Sri Lanka. Madras, India, June 1986.

44. Pivoting Engine Installation for Beachlanding Boats. A. Overa, R. Ravikumar. Madras, India, June 1986.

45. Further Development ofBeachlanding Craft in India and Sri Lanka. A. Overa, R. Ravikumar, 0. Gulbrandsen, G. Gowing. Madras, India, July 1986.

46. Experimental Shrimp Farming in Ponds in Polekurru, Andhra Praclesh, India. J. A.J.Janssen, T. Radhakrishna Murthy, B. V. Raghavulu, V. Sreekrishna. Madras, India, July 1986.

47. Growth and Mortality of the Malaysian Cockle *(Anadara Grartosa)* under Commercial Culture: Analysis. through Length-Frequency Data. Ng Fong Oon. Madras, India, July 1986.

48. Fishing Trials with High-Opening Bottom Trawls from Chandipur, Orissa, India. G. Pajot and B. B. MohaDatra. Madras, India, November 1986.

50. Experiences with Manually Operated Net-Braiding Machine in Bangladesh. B C. Giligren. Madras, Indlia, November 1986.

51. Hauling I)cvices for Beachlanding Craft. A. Overa, P. A. Flemnsinghvth. Madras, India, August 1986.

53. Atlas of Deep Water l.)emersal Fishery Resources in the Bay of Bengal. T. Nishida and K. Sivasubramaniam. Colombo, Sri Lanka, September 1986.

Manuals and Guides (BOBP/MAG/. . .

I. Towards Sisared Learning: Non-formal Adult Education for Marine Fisherfolk. Trainers' Manual. Madras, India, June 1985.

<<

2. Towards Shared Learning: Non-formal Adult Education for Marine Fisherfblk. Animators' Guide. Madras, India, June 1985.
3. Fishery Statistics on the Microcomputer: A BASIC Version of Hasselblad's NORMSEP Program. D. Pauly, N. David, J. Hertel-Wulif. Colombo, Sri Lanka, June 1986.

Miscellaneous Papers (BOBP/MIS/.

1. Fishermen's Cooperatives in Kerala: A Critique. John Kurien. Madras, India, October 1980.
2. Consultation on Social Feasibility of Coastal Aquaculture. Madras, India, 26 November—1 December 1984. Madras, India, November 1985.
3. Studies on Mesh Selectivity and Performance: the New Fish-cum-Prawn Trawl at Pesalai, Sri Lanka. M.S.M. Siddeek. Madras, India, September 1986.
4. Motorization of Dinghy Boats in Kasafal, Orissa. S. Johansen and 0. Gulbrandsen Madras, India, November 1986.

Information Documents (BOBP/INF/....)

1. Women and Rural Development in the Bay of Bengal Region: Information Sources. Madras, India, February 1982.
2. Fish Aggregation Devices: Information Sources. Madras, India, February 1982.
3. Marine Small-Scale Fisheries of India: A General Description. Madras, India, Marcn 1983.
4. Marine Small-Scale Fisheries of Andhra Pradesh: A General Description. Madras, India, June 1983.
5. Marine Small-Scale Fisheries of Tamil Nadu: A General Description. Madras, India, December 1983.
6. Marine Small-Scale Fisheries of Sri Lanka: A General Description. Madras, India, November 1984.
7. Marine Small-Scale Fisheries of Orissa: A General Description. Madras, India, December 1984.
8. Marine Small-Scale Fisheries of Bangladesh: A General Description. Madras, India, September 1985.
9. Food and Nutrition Status of Small-Scale Fisherfolk in India's East Coast States: A Desk Review and Resource Investigation. V. Bhavani. Madras, India, April 1986.

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