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DP/ID/SER.A/1582
4 June 1992
ORIGINAL: ENGLISH

STRENGTHENING THE TECHNICAL AND MANAGERIAL CAPACITIES OF THE
CARPENTRY COOPERATIVES IN MUKALLA AND SEIYUN

SM/YEM/92/035

THE REPUBLIC OF YEMEN

Technical report: Assistance in the improvement of production methods.*

Prepared for the Government of the Republic of Yemen
by the United Nations Industrial Development Organization,
acting as executing agency for the United Nations Development Programme

Based on the work of Radmilo Malis,
expert in furniture and joinery production

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Vienna

* This document has not been edited.

V.92-54982

EXPLANATORY NOTES

- A full stop (.) is used to indicate decimals.
- A comma (,) is used to distinguish thousands and millions.
- Reference to dollar (\$) is to United States Dollars, unless otherwise stated.
- The monetary unit of the Republic of Yemen is the Yemeni Dinar (YD) and Rial (R). During the period covered by this report the official exchange rates were: US\$ 1-0.461 Yemeni Dinar and 12 Rials, and 26 Rials to 1 Yemeni Dinar.
- The contraction CSCC has been used for the Coastal Strip Carpentry Cooperative in Mukalla and CC Seiyun for the Carpentry Cooperative in Seiyun.
- The Government body responsible for this project is the Ministry of Industry's Office in Mukalla, and the General Director of this office. Mr. Omar Badufary is the project's National Director.

TABLE OF CONTENTS

Abstract	1
1. Introduction	1
2. Background information on the project	2
3. Findings	4
- Improvement of production methods	4
- Improvement of technical designs of products	5
- Quality of products	5
- Raw material utilization	7
- Selection of hardware and other components	7
- Selection and maintenance of tools	7
- Machining and assembling operations	8
- Working conditions and safety	9
- Organization of production	9
4. Activities	9
- Improvement of production methods	9
- Improvement of maintenance of woodworking tools	13
- Preparation of training manuals	15
5. Conclusions	15
6. Recommendations	15
ANNEXES	
I Job description	16
II Names of the expert's counterparts and list of persons met	20
III Substantive Officer's Comments	21

ABSTRACT

The Furniture and Joinery Production Expert's fourth mission to the Carpentry Cooperative in Mukalla was carried out from 1 April to 15 May 92.

Acting as the Project's Chief Technical Adviser, the expert worked closely with the counterparts and carried out the activities foreseen in the project's work plan.

The expert focused his assistance on further improvement of production methods in order to replace inefficient manual work with machining operations. Part of the expert's time has been devoted to improvements of the tool maintenance methods in the Carpentry Cooperatives in Mukalla and Seiyun.

The expert prepared training manuals on wood sanding and surface finishing operations in the furniture and joinery production, but the corresponding training courses have been postponed until the Cooperatives provide some elementary conditions for practical training.

1. Introduction

The UNIDO project SM/YEM/92/035 (previously SM/PDY/87/005) entitled "Strengthening the Technical and Managerial Capacities of the Carpentry Cooperatives in Mukalla and Seiyun", has been established to facilitate the transition of furniture and joinery manufacture in the Cooperatives from a handicraft stage to more efficient industrial production methods.

The project document was signed by the Government of the People's Democratic Republic of Yemen, the United Nations Development Programme (UNDP) and the United Nations Industrial Development Organization (UNIDO) as executing agency, on 10 April 1989.

The Government agency coordinating the project is the Ministry of Industry, and the General Director of the Mukalla Office, Mr. Omar Badufary is, presently, the project's National Director.

The furniture and joinery production expert, Radmilo Malis, assigned to the project as Chief Technical Adviser, undertook his fourth mission from 1 April to 15 May 1992.

According to the project document, the project's immediate objectives are to:

- (a) Introduce suitable management systems, techniques and methods to develop self-sustaining management capacities capable of formulating and updating simple marketing plans, cost analysis and cost accounting, applying new concept of production planning, organization, quality and stock control to the Cooperatives and importing raw materials at the lowest possible cost.
- (b) Introduce new technologies and techniques and train the technical cadres of the Carpentry Cooperatives in order to develop the human and technical capacities to introduce product and production improvements and innovations independently.
- (c) Increase the labour productivity of the manual labourers of the Cooperatives as well as their capacity to adapt to production

improvements and innovations through training in basic woodworking skills, machine use and machine maintenance.

During this mission, the expert's assistance has focused on further improvements of production methods and tool maintenance in the Cooperatives. The expert prepared two training manuals on sanding and surface finishing in manufacturing furniture and joinery. Requisitions for expendable equipment (spare parts and woodworking tools) have been issued and submitted to UNIDO for purchase.

Some aspects of the further development of the Cooperatives and what should be done by the management has been discussed with the managers of the two Cooperatives and suggestions on how to proceed have been given. Once again, the expert emphasized the importance of the quality of the products and what has to be done by the management in order to make the quality control system efficient.

The expert's visit to the Carpentry Cooperative in Seiyun was for only three days, because the Cooperative was unable to assure any accommodation, either in Seiyun or in neighbouring cities, until the last week of his mission. During this very limited time the expert helped the Cooperative to start production in the new site in Seiyun.

On the way to Mukalla and back the expert stopped in Sana'a and visited the UNDP Office to request an extension of his Yemeni visa, exchange necessary information and discuss matters of the project's development with the Programme Officer.

During this mission, the UNDP Programme Officer visited the project site in Mukalla in order to appraise the situation regarding a realistic project completion time and to discuss the project budget revision.

2. Background information on the project

The first technical assistance to the woodworking sector in the People's Democratic Republic of Yemen was provided in 1978 through a review of the Aden Public Corporation for Carpentry. It was followed in 1981 by project PDY/81/006 "Training in Management and Efficiency Improvements". The survey team's findings indicated the urgent need for technical assistance to the Coastal Strip Carpentry Cooperative in Mukalla, in the Hadramawt Governorate, in order to consolidate the operation of its three production units. Thus, in 1983, during a three-month mission the blueprint for a central workshop in Mukalla was prepared and the necessary technical assistance to implement this plan was provided.

This project aims at following up on the previous missions and providing the necessary technical assistance to the Coastal Strip Carpentry Cooperative (CSCC) in Mukalla and the Carpentry Cooperative (CC) in Seiyun.

The CSCC in Mukalla was established in 1973 when 150 carpenters pooled their resources to form the Cooperative. The CC in Seiyun was established in the same way one year later.

The two Cooperatives operate in the Hadramawt Governorate. The CSCC has three production units located in Jol Massa, Ghail Bawazer and Shahr. The CC

Seiyun has four production units located in Seiyun, Tarim, Shibam and Al Hawta.

With the exception of one of the Mukalla workshops located in Jol Massa, the others are all small-scale production units maintaining typical artisanal manufacturing methods and supply their immediate surrounding with simple joinery and furniture products. Almost all items are produced on demand and according to the customers' specifications and designs. Production planning is totally dependent on the customers' orders on hand.

The CSCC in Mukalla has about 370 employees and the CC in Seiyun about 180 employees. The sales volume has not changed significantly during the last ten years, and currently it ranges between US\$ 8,000 and US\$ 10,000 per year and per employee.

In general, both Cooperatives manufacture low quality products at high production costs. However the products made in Mukalla are far better than those made in Seiyun. The low productivity and quality can be attributed mainly to poorly equipped workshops with old and worn-out machines, to the inadequate design of the products and to an extensive use of expensive raw materials.

The Cooperatives sell their products to local customers, rarely further than 25 km away, but they still cannot meet demand and delivery times are extremely long.

The Republic of Yemen's present development strategy is focused on strengthening its structure. It concentrates on increasing the utilization of existing production capacities through the rehabilitation of selected factories and on improving the production and managerial capacities in industrial enterprises. This project has these objectives.

The original budget allotted to the project (from funds earmarked for Special Measures for Least Developed Countries) amounted to US\$ 346,450, with an additional Government input (in kind) of YD 20,000.

The latest budget revision "E", dated 19 November 1991, shows a total of US\$ 385,341 plus a Government cost sharing (Yemeni dinars converted to dollars by the UNDP) of US\$ 61,945, and a Government input (in kind) of YD 43,589.

The project was planned for a duration of two years and aimed at changing the existing artisanal manufacturing process to an industrial production system. It was originally planned that the technical assistance be provided by three experts: a furniture and joinery production expert, a marketing consultant and a cost accounting consultant with a total duration of 18 man/months; and by two United Nations Volunteers: a wood processing engineer and a master carpenter, for a total of 48 man/months.

After the project started, it was agreed to replace the three-month marketing consultancy by a consultancy in the maintenance of woodworking tools of the same duration.

The project started in January 1990 when two UN Volunteers arrived in Yemen, and intensive work began in March 1990, when the Chief Technical Adviser and the Cost Accounting Consultant commenced their missions.

Prior to the current mission, the CTA undertook three missions totalling nine months. In the meantime, the Tool Maintenance Consultant completed his mission and the two-year contract of the two UN Volunteers have been completed.

This was the fourth mission of the Chief Technical Adviser. Originally, it was planned to last three months, but after estimating the project's needs, the balance was extended to 4.5 months, of which 1.5 months for this mission, while the remaining three months will be undertaken after the Cooperatives have received all the equipment that has been purchased by the project.

It is expected that the project will be finished by June 1993. This delay is due to the project's later start (and because of delays in purchasing the equipment funded from the Government's cost sharing contribution). It will be received during 1992. Due to this, the last mission of the furniture production expert will be undertaken in the beginning of 1993. It is indispensable that the expert assists the counterparts in the installation of the equipment and helps in its introduction into the production process.

Taking into account delays caused by various factors, the accomplishments of the project are as laid out in the project's work plan.

3. Findings

During the mission covered by this report, the expert's attention was mainly concentrated on the improvement of production methods and the improvement of tool maintenance. The findings that will be considered in this report refer mainly to these two topics. Some other observations will also be pointed out.

IMPROVEMENT OF PRODUCTION METHODS

Improvement of production methods have been carried out on a continuous basis during the project's execution. The results depend mainly on the readiness of the Cooperatives to accept changes and to comply with the expert's recommendations.

Though all the improvements proposed and accepted so far have proven to be both successful and useful, the counterparts sometimes ignore some of the recommendations, especially when they call for changes in the existing system of wages based strictly on a unit of product. The counterparts can hardly conceive that improvement of production as a whole consists of numerous small improvements, each requiring certain changes.

The expert's work has been directed at introducing improvements in the following areas of production:

- Technical designs of products,
- Quality of products,
- Raw material utilization,
- Selection of hardware and other components,
- Selection and maintenance of tools,
- Machining and assembling operations,
- Working conditions and safety,
- Organization of production.

A certain progress has been achieved in all these areas. Some limitations exist due to the lack of some basic equipment and appropriate tools; but the biggest impediment is the lack of technically educated personnel who can understand and carry out improved production methods. However, in the existing conditions there are many possibilities for improvements, especially for replacing tasks performed manually with machining operations. This is not always simple because it requires synchronization of activities relating to changing some details of technical design (mainly joints), replacing some existing hardware items with more appropriate ones, introducing jigs and some new woodworking tools, constructing jigs, breaking down the production process into single operations, establishing standard times and measuring effects of work based on these time standards and not on the global time for a whole product. The Cooperatives are not yet mature for such a systematic approach and it takes more time to accomplish any improvement. The expert is aware of this situation and of the necessity for persistent efforts in order to overcome both poor technical conditions and a passive attitude of the counterpart staff.

IMPROVEMENTS OF TECHNICAL DESIGNS OF PRODUCTS

Many jointing elements are designed to be done using hand tools such as: hand saws, chisels, hand drills etc. These joints cannot be done on the existing machines unless they are somewhat modified. If the joints were to be changed and adapted for machine production, that would require adequate machining tools and, very often, jigs. These jigs should also be constructed. The joints must be machined with certain tolerances. Appropriate production documentation, such as detailed drawings, operational lists etc. should be completed. The machines must be maintained properly to attain the required accuracy. The machine's tools must be maintained, ground and set correctly. Quality control should be employed to ensure that the parts are made precisely enough to permit interchangeability. Each operation should be paid separately. On the other hand, all this is unnecessary if a carpenter makes a product by adjusting each single part during assembling. Considering all this, the counterparts hesitate to take new burdensome tasks, and would rather continue in the traditional way that they have used hitherto.

Technical design is of decisive importance. This is the main prerequisite for all other improvements. It can be done in various ways depending on the material used, the machines and tools available, hardware to be used and the part's function in the product.

Some changes in the design of furniture items are accepted because these items are made according to the rough drawings made by a carpenter acting as a designer. Joinery items are however almost always made without any design drawing since the construction and sizes are known to the carpenters. A great amount of time is used for drawing the joints by pencil on all parts. Very simple jigs or templates can be constructed and used in order to avoid drawings on parts and, in addition to achieve higher productivity and accuracy. Unfortunately, these drawings are done by old and influential carpenters and that is another obstacle to changes.

QUALITY OF PRODUCTS

Some improvements of quality of products are noticeable, but it is yet far from satisfactory. The control of quality which had started very well in Mukalla is reduced and its importance has been degraded. Two quality

controllers, one in the machining and the other in the assembling section, report to the production supervisors and are rather neglected. However, their presence and warnings are useful.

According to the expert's observations and quality control reports, the main quality problems are caused by the following four groups of defects:

- Defects in raw material: cracks, splits, rotten wood, discolourations and an enormous number of insect borings.
- Inaccurate machining: deviations from the required dimensions, straightness and rectangularity, deviations from the required shape and inaccurate dimensions of the jointing elements.
- Rough machined surfaces, mainly due to the use of inadequate tools having the wrong cutting angles, as well as because of low cutting speed and high feeding rates.
- Damaged edges of workpieces because of careless handling and throwing the machined parts on the floor.

Analyzing each of these groups the expert drew out the following conclusions:

- The sawn timber imported from Malaysia is a mix of various species having different colours and hardness. It is usually delivered in a satisfactory quality. The Cooperative did not accept the expert's recommendations to stack the timber correctly for seasoning and to protect it from an excessive exposure to the sun's rays. Consequently, the quality of timber deteriorates causing inevitable defects in the wooden parts.
- The inaccuracy of machining is caused by many factors, such as:
 - The woodworking machines are worn out and not properly maintained.
 - Inaccurate setting of machining tools.
 - The parts are made out of both soft and hard woods and are processed with the same tools and feeding speeds.
 - Enormous deviations in the dimensions of the raw material.
 - Free-hand sawing according to pencil drawings on the parts without using jigs.
 - Cutting to the precise length is left to be done during assembling, so that the parts do not have a base for proper positioning against stops and eventually jigs.
- Rough surfaces after machining are a result of inadequately selected and improperly sharpened woodworking tools. Dull tools very often heavily damaged, non-balanced and inaccurately set on the machine, are permanently in use. The feeding speed is not adjusted to the processing conditions such as direction of cutting, hardness of wood and the thickness of the wood layer to be removed.
- Damaged edges are not even considered as defects, though they are numerous and make the products look very poor. The carpenters are in the habit of throwing the machined parts on the floor and pile them up

later on. Heavy parts with sharp edges are very often damaged and then assembled without being repaired.

Many quality problems could be solved without any investment in equipment if only the counterparts would follow the instructions given through the training courses and elaborated in the training manuals. All these facts have been presented to the counterparts once again. They usually agree with the expert's conclusions, but very little has been changed.

RAW MATERIAL UTILIZATION

Among the most valuable results achieved by the project is a significant improvement in the utilization of raw materials. Basically, there are two main areas aiming at increasing the utilization of materials. The first is related to the changes in the design and construction of the products. Many unnecessary parts have been eliminated and those which were over-dimensioned have been reduced in size. This area was rather successful though many further improvements are yet to be introduced. The second task was aimed at a better utilization of raw materials through better planning and using some more efficient methods in cutting timber and panels. Cutting lists and sizing schemes have been proposed, but never accepted and used. A great deal of raw material is lost as waste which could have been saved; and waste could have been reduced through better planning of its utilization.

SELECTION OF HARDWARE AND OTHER COMPONENTS.

The Cooperative in Mukalla has very good hardware catalogues from various producers, but they rarely use them. All the existing hardware selected is of the lowest quality and technologically unsuitable. Some more suitable hardware items, which could ensure a significant reduction of the assembling work and improve the quality of the products, have been recommended by the expert, but unfortunately, they have not been included in the purchase orders.

Some hardware items, like locks, are used excessively and all casegoods are fitted with a large number of unnecessary cylindrical locks which are expensive, unpractical and rather ugly.

So far, the Cooperatives have used the so-called "H" hinges for all their joinery products. This requires making housings for hinges by using chisels, which takes a lot of time and looks rough. If the counterparts would accept to purchase and use "screw-in" hinges, all that should be done is to pre-drill the components by using either a fixed or a portable drilling machine. No additional screws are necessary as is the case for the "H" hinges. A similar situation exists with some other components like the profiles for sliding glass doors, some joints etc.

SELECTION AND MAINTENANCE OF TOOLS.

The selection and maintenance of tools is currently probably the most critical problem in both Cooperatives. A wrong selection of woodworking tools at the time of purchase, without considering their technological parameters, a wrong handling of carbide tipped tools, incorrect sharpening and their inadequate use are key problems which have many negative consequences. There is not one person who is competent and responsible for this aspect of production.

In the past, tools were ground by the carpenters themselves by using bench grinders and free hand. Universal tool grinding machines have been purchased by the project and sharpening rooms established in both the Cooperatives. A two-month tool maintenance consultancy was provided and tool sharpeners trained. But, obviously, this was not enough for persons who were without any previous knowledge or experience in this field. To make matters worse, the Cooperative in Seiyun has in the meantime changed four times the person occupying this position.

All this results in many errors, such as:

- Tools are not cleaned properly before sharpening, but given back to the production with resins stuck on them.
- Defective tools are not corrected or repaired, but used in spite of hazardous risks.
- Tips on tungsten-carbide tools are damaged because of inappropriate handling.
- The correct elements of tool geometry are not maintained.
- Inappropriate grinding wheels are used.
- Tools are not properly set for sharpening.
- There is no control of tools.

The low quality of the machined parts, the low productivity, the increased consumption of energy and dangerous work with incorrect tools are some of the negative consequences.

MACHINING AND ASSEMBLING OPERATIONS.

The Cooperatives only do rough machining, including surface planing, thickening, tenoning, mortising, rebating and some drilling. Machined parts are stored in the intermediate storage room and are issued later on to the assemblers. An assembler takes all the parts of a certain product and does all assembling operations for that item. Assembling is done using hand tools and powered (electrical) hand drills. Pre-assembled frames are taken back to the machining section (in another building) and profiled and rebated, and returned for fitting into the product. An enormous amount of adjustment work is done, including cutting (hand-sawing) to the lengths required to fit to the other related parts. The frames are once again taken to the machining area to make horizontal rebates, after cutting the stiles.

This production system results in many shortcomings. The machine operators do not endeavour to achieve a higher accuracy because they expect that anyhow the assemblers will adjust the parts. The possibilities of the woodworking machines are not fully utilized. Transportation costs are unnecessarily high. The productivity is very low. Jigs are not used either for machining nor for assembling. The products look rough and poor.

WORKING CONDITIONS AND SAFETY.

Safety measures are not prescribed. The expert's instructions given in the training courses are ignored. The woodworking machines are used without any safety guards and other protective devices. The working areas are crowded with material and heaps of dust. The intensity of noise is intolerable. Only a few of the carpenters wear goggles or ear muffs. A great part of the workshop is crowded with the excess (unwanted) parts or rejects accumulated over several years.

ORGANIZATION OF PRODUCTION.

In the Cooperatives' organizational structure production has a central position. There is also a formal organizational structure of production units. It is based on an artisanal production system which has a long tradition. However, the efficiency of this organization is not satisfactory. Competence and responsibilities are not very clear. The carpenters can either accept or reject their supervisor's orders. Regulations are not complete and consistent. The system is rather rigid and does not encourage innovations. Informal groups are very influential, especially with regard to the election of the manager or to the appointment of supervisors.

In such an organizational environment it is very difficult to impose a new idea or proposal. The system will accept novelties, especially complex ones, only if it will not affect anyone in the workshop, which is rarely the case.

Some of these findings are mentioned also in the expert's previous reports, but have been repeated here in order to emphasize some crucial facts and to help the management of both Cooperatives to better understand the situation and to undertake appropriate steps towards gradual changes which are inevitable.

4. Activities

Due to the rather short duration of this mission the expert's activities were focused on the following three tasks:

- Improvement of production methods.
- Improvement of maintenance and sharpening of woodworking tools.
- Preparation of training manuals.

IMPROVEMENT OF PRODUCTION METHODS

Since the Cooperatives will receive some new woodworking machines very soon that will permit the changing of the production system and the introduction of industrial production methods, the expert concentrated his efforts to reduce manually performed operations and ensure a better utilization of the available machining capacities. This was considered as a gradual adaptation to the future situation. With regard to the machining operations the expert tried to eliminate pencil markings on the parts and to introduce the use of jigs and templates for more precise and more productive machining. Some characteristic examples are explained hereinafter.

Example 1: Machining and assembling window and door casements is the permanent job of a numerous group of carpenters. The regular construction of

these casements consists of an open tenon-mortise joint, with the tenon extended into the horn used to fix the window or door into the wall. The mortises on the top and bottom rails are done using chisels, because this mortise cannot be done on any of the existing machines.

By changing the construction, the open mortises are eliminated and the complete joint can be done on machines and, in addition, it would be more precise (see Fig. 1).

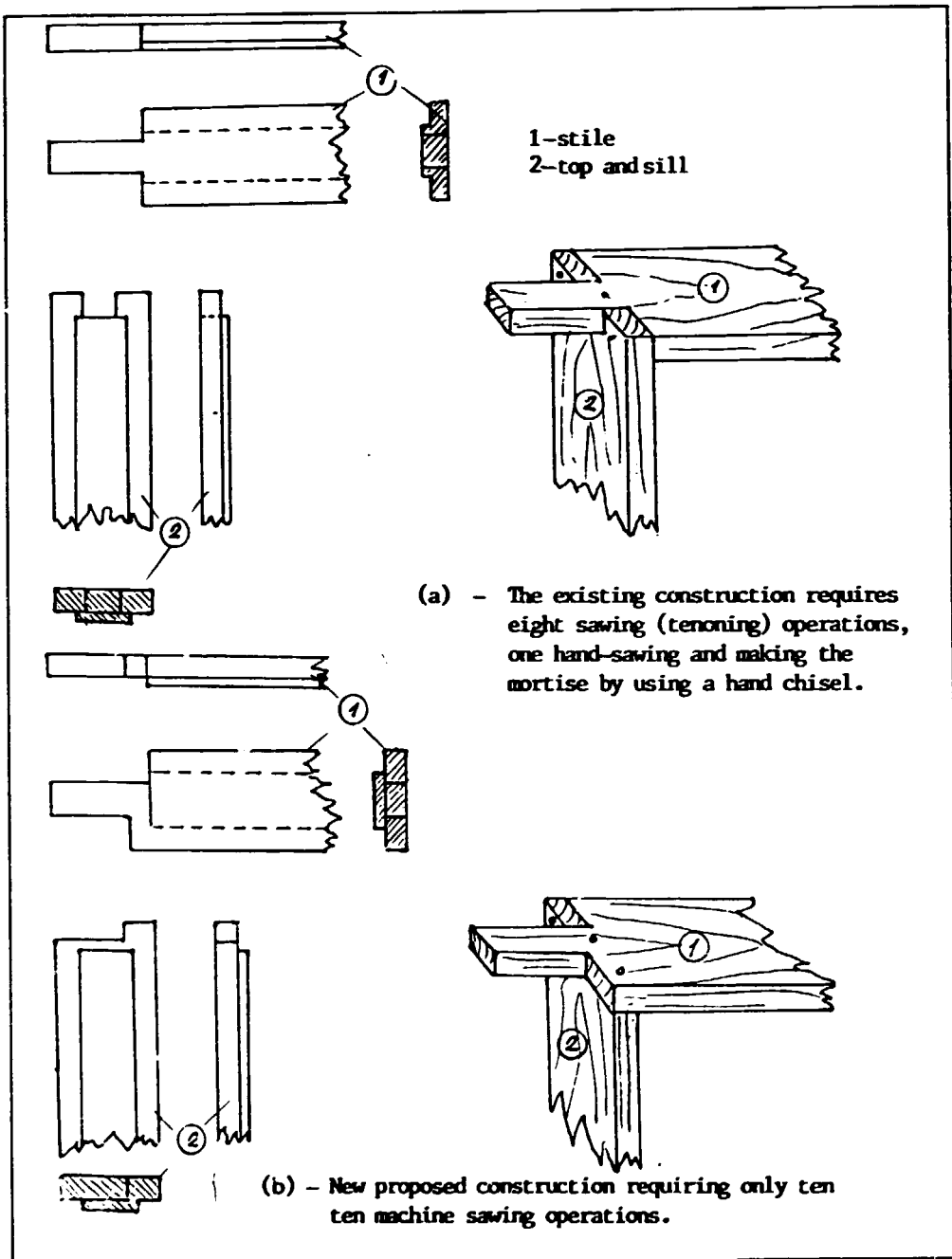


Fig. 1.: Joint of window and door casement.

Example 2: The preassembly of window leaves has been explained in the findings of this report. By changing the place of pre-assembling and by having this operation done in the machining section, 80 percent of the transportation is reduced and stiles can be cut to the required length by using machines instead of handsaws (see Fig. 2).

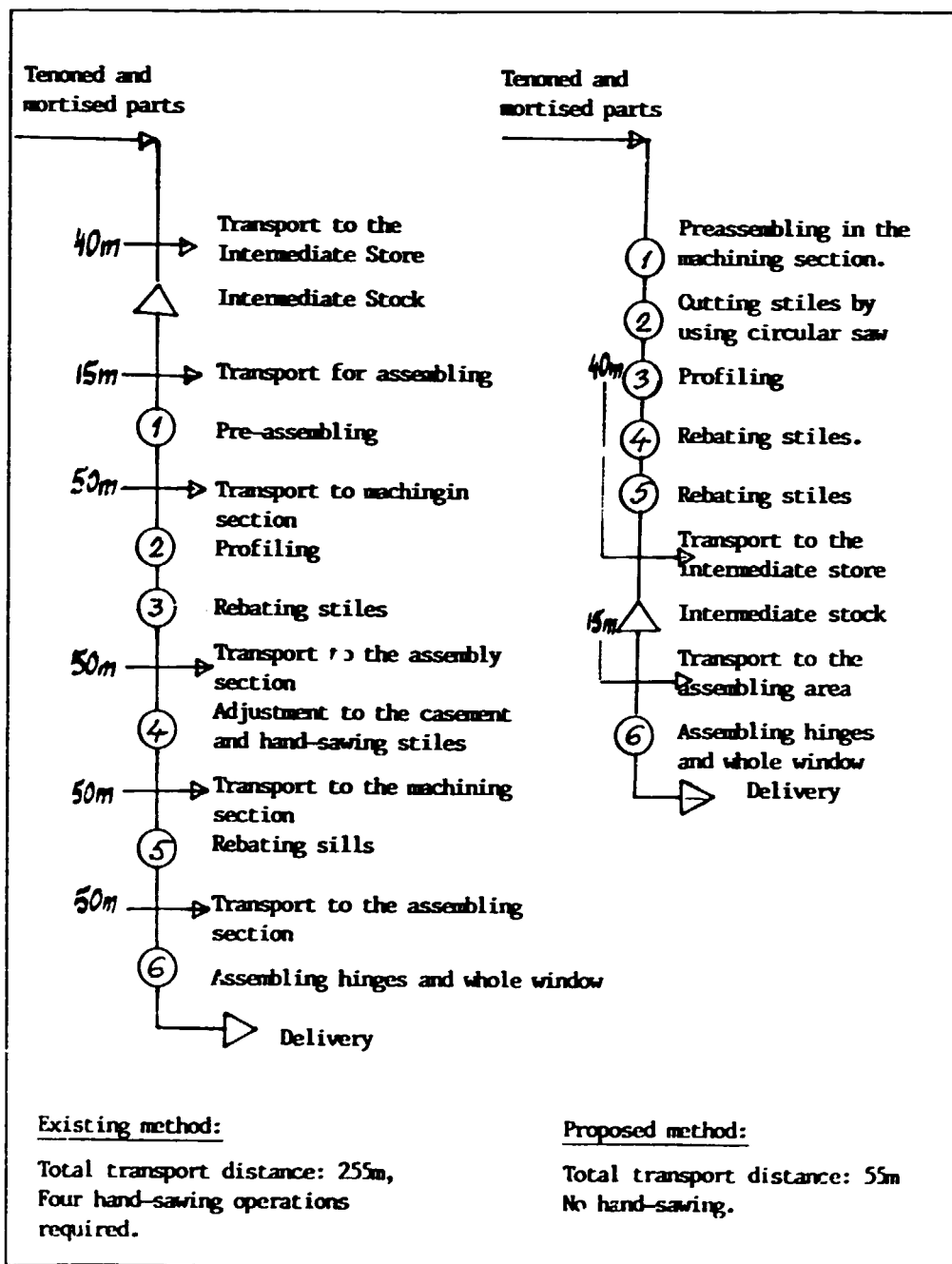


Fig. 2: Flow chart of assembling and machining window leaves.

Example 3: If the "H" hinges were to be replaced with more favourable "screw-in" hinges, making of casements for "H" hinges and the buying and screwing of numerous screws would be eliminated, and the productivity of assembling windows would be more than doubled. Also, in the case of using "screw-in" hinges, rebates on the casement parts are not necessary and boards of smaller thickness can be used, saving up to 20 percent of material used for these parts (see fig. 3).

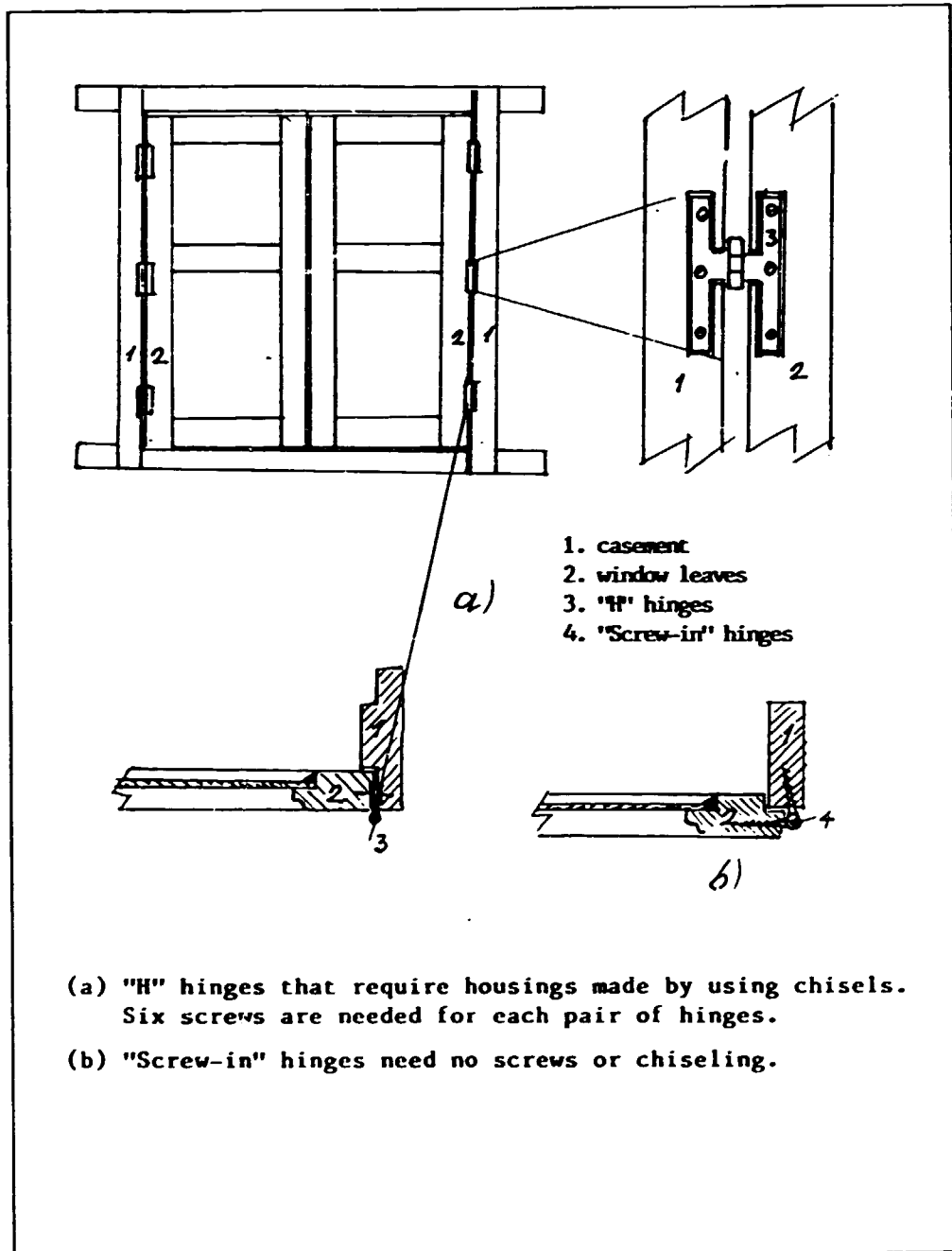


Fig. 3: Replacement of "H" hinges by more suitable "screw-in" hinges.

Example 4: Several carpenters permanently work on pencil marking parts to be machined. Machining according to pencil markings is very inaccurate, and slow. By using some simple jigs or even stoppers, this pencil marking could be avoided almost completely.

These are only a few of many examples that show how the processing operations can be improved without buying new equipment. This does not mean that new equipment is not necessary. On the contrary, it is badly needed and big advancements are not possible without new machines and tools.

The expert's proposals have been explained to the counterparts; staff of both Cooperatives and they were supposed to apply them in their every day production.

The purpose of this work was not only to improve certain technological operations, but to teach the counterparts a new way of thinking and analyzing their work and a method showing how to achieve certain improvements. Due to the complexity of this work, and the total absence of technically educated people in the Cooperatives, the progress is rather modest. During the expert's absence, between his missions, all the project's activities are reduced, including the implementation of improved methods.

Recently, the Cooperative in Mukalla hired a group of young carpenters who were trained in the local vocational training centre. These young carpenters show more readiness and enthusiasm for change, but they are still considered as beginners and their initiatives are not taken seriously.

IMPROVEMENT OF MAINTENANCE OF WOODWORKING TOOLS

Though many tool maintenance problems exist, the expert tried during this assignment to assist the counterparts in improving jointing and sharpening narrow bandsaw blades and tungsten carbide tipped circular saw blades. Both Cooperatives have electrical welders for jointing bandsaws which are in good condition. However, the joints were very bad because of poor preparation of the blade ends to be jointed and wrong grinding of the welded joints. Dull shear knives were used and the ends to be jointed were deformed. The parts of the blades inserted into the welder clamps were not cleaned causing variations in electrical conductivity. The welded joints were only roughly ground on bench grinding wheels. The final results were joints with overlapped ends, unequally welded, with changed pitch of the teeth adjacent to the joint, and with an uneven and not smooth joint.

By correcting all these failures, excellent joints have been achieved and the number of breaks has been sharply reduced in both Cooperatives. In addition to this the saw doctors have been instructed on how to correct defects on the blades, and how to obtain straight edges on the bandsaw blades. Unfortunately, they do not have any suitable tools for flattening and tensioning the blades.

The sharpening of the narrow bandsaw blades was also totally wrong because the hook angle on all the blades used was negative. Newly purchased saw blades have the correct positive hook angle, about 5° to 10°. This results in an enormous resistance to sawing and in many cracks in the gullets of the blades. There were three major reasons for this: First, the saw doctor did not know that the hook angle is wrong and that it is important at all. Second, for a pitch of 10 mm, a 15 mm thick grinding wheel was used

causing deformation on the teeth's faces. And third, the grinding machine in Mukalla is so loose that the sawblades move front and back at every stroke of the grinding wheel. There was another error: the centre of the grinding wheel was about 10 mm outside the blade's plane.

These mistakes have been corrected to the extent possible, bearing in mind the absence of adequate grinding wheels and a good grinding machine. It has been recommended to the counterpart in Mukalla (Seiyun has a better grinder) either to make a general overhaul of its grinder or to buy a new, and if possible, better one.

The tungsten carbide tipped (T.C.T.) circular sawblades were also poorly maintained and sharpened. Defective sawblades are normally used for sawing. The Cooperatives cannot repair the saw teeth and they try to utilize them as much as possible entailing deformations of the machines, higher consumption of energy, low productivity and very poor performance with regard to accuracy and quality of sawing in general.

Several major mistakes are being made with regard to the maintenance of T.C.T. circular sawblades. Blades are commonly placed on metal plates either at the machine or in the sharpening room. Saw blades are stacked one on top of the other with the teeth ruining each other. The blades are rarely cleaned properly and metal objects are used to scrape the resins stuck to the blades. Diamond grinding wheels are used for grinding both tungsten carbide tips and metal parts supporting these inserted tips. It resulted in quick wearing out very expensive diamond wheels and unsatisfactory results of grinding.

The carpenters prefer to grind the sawblades by free-hands feeding, rather than to use a very good new universal grinding machine. The consequences are that the original tooth parameters have been changed and that the heights of teeth are no longer equal.

It is very interesting that the same sharpener in Mukalla has been instructed by the expert on all these matters half a year ago, and that he was performing better at that time than he is now. The Cooperative should think about his motivation.

In the Carpentry Cooperative in Seiyun, the situation with respect to tool sharpening is slightly better. The bad thing is that four sharpeners have been changed during the last half year, and that the new grinding machine was not handled properly so that some parts already need replacement.

There is a general conclusion that the Cooperatives do not have the personnel that is able to select appropriate tools with regard to all the parameters important for an efficient performance. They have good catalogues, but they rarely use them. Neither do they use the instructions given in the training manuals for various machining operations.

This time, the expert gave the counterpart an instruction manual on tools, jigs and measuring instruments used in the manufacture of furniture and joinery, to be translated into Arabic and used by the Cooperatives. Unfortunately, the manual does not cover sharpening techniques, but it can be of great help to the people who select the tools for purchase and for the production supervisors and quality controllers who should check that the tool is correctly prepared.

PREPARATION OF TRAINING MANUALS

In accordance with the project's work plan the expert has prepared manuals for wood sanding and surface finishing operations. These two manuals have been combined into one, because these two production phases are very closely related. Both sanding and surface finishing operators should be trained together.

The training course on sanding and surface finishing has been postponed for the expert's next mission when the cooperatives will have some (though limited) possibilities for practical training.

The manual on sanding and surface finishing in the manufacture of furniture and joinery will be issued as a separate technical report.

5. Conclusions

This mission was rather short and the expert had to leave the project before some solutions were fully introduced.

The Cooperatives lack a strategy concerning their future development, level of specialization and expansion into the market.

The Cooperatives also have no plan for overcoming the problem of lack of technicians capable to continue the further development of these companies. Transfer of know-how in this situation is rather difficult, but it will be more difficult later on to continue making use of the project's achievements.

6. Recommendations

It would be very useful if the expert's remaining mission would not be split, but carried out as one.

The management of both Cooperatives should set some objectives and establish some basic business strategies which will mark the direction of future development and serve as a strong motivational factor for all the employees.

The Cooperatives have no alternative but to invest some money for getting their own technically educated people who will accelerate the modernization of their production and the business as a whole.

ANNEX I



UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION

Project of the Government of the People's Democratic Republic of Yemen
Strengthening the technical and managerial capabilities of the Carpentry
Cooperatives in Seiyun and Mukalla

JOB DESCRIPTION

SM/YEM/92/035/11-01/J13101

Post title Furniture and Joinery Production Expert (CTA)

Duration 12 months - split mission (6, 3 and 3 months)

Date required As soon as possible

Duty station Mukalla with travel to Seiyun and Aden

Purpose of project To strengthen the Technical and Managerial capabilities of the carpentry cooperatives in Mukalla and Seiyun.

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The Furniture and Joinery Production Expert, the project's Chief Technical Advisor, will lead a team comprising a cost accountant, a marketing consultant (each assigned for three months) and two United Nations Volunteers (a woodworking technician and a master carpenter), each assigned for two years.

He will undertake his assignment in three phases, the first of six months, and the other two of three months each, over a period of two years. He will be responsible for initiating and supervising all technical activities in the project, the drafting of training manuals and reports, devising systems, procedures and mechanisms as well as providing training to middle and top management of the cooperatives.

Phase I (six months)

During this phase he will be expected to:

1. Review the different systems for production planning and control, organization, procurement and inventory control, quality control, machine and tool maintenance.

2. Advise on improvements, modifications, and, where appropriate, on the introduction of new systems of production - including modifications to products, plant layout, equipment and processing technology and draw up plans for implementing his recommendations.
3. Review the current designs and the capacities for design in both cooperatives and recommend changes to facilitate the introduction of serial production methods.
4. Recommend changes to the product development and production planning and control departments.
5. Identify bottlenecks and excess capacity and suggest a product range, or modifications to the products being made, to ensure a fuller use of the installed capacity.
6. Assess the current skills of operators and suggest methods for increasing skills and productivity.
7. Assess the need for training manuals and draw up the contents of these.
8. To the extent possible draft these manuals.
9. Draw up a work plan for the two UN Volunteers.
10. Survey the state of the equipment installed and draw up a plan for the rehabilitation of existing machines.
11. Draft a technical report covering his activities during the first phase.

Phase II (three months):

During this phase, he will be expected to:

1. Supervise the implementation of the systems recommended under item 2 of Phase I.
2. Conduct short in-country training seminars on production planning, production control, inventory control, quality control.
3. Guide the UN Volunteers in their work and, if need be, modify their work plan.
4. Review the cooperatives' procurement policies and recommend changes.
5. Review the designs prepared as a result of the recommendations made under item 3 of Phase I and suggest a rudimentary system of testing these.
6. Review the progress in the rehabilitation of machines and, if need be, modify the plan.
7. Introduce safety at work procedures and train operators in this field.
8. Supervise, and if necessary modify, the implementation of changes in plant layout, machines, etc. suggested in Phase I.

9. Introduce a more rational use of jigs in production.
10. To the extent possible, draft additional training manuals.
11. Draft a technical report covering his activities during the second phase.

Phase III (three months):

During this phase, he will be expected to:

1. Review the progress of the UN Volunteers, and, if need be, modify their work programme.
2. Review the progress of all the activities undertaken so far and complement these if need be.
3. Complement the training manuals already issued by additional ones whose need has been felt.
4. Revise, and if need be, modify all the training manuals prepared by the project.
5. Draw up technical reports outlining follow-up by the management of the cooperatives, the government and international organizations.
6. Draft the project's terminal report.

Qualifications

Engineer or wood technologist with long experience at policy making level in the management of small to medium sized furniture plants.

Language

Arabic preferred, English acceptable.

Background information:

The woodworking sector in the People's Democratic Republic of Yemen consists of the Public Corporation for Carpentry in the Aden Governorate and two carpentry cooperatives in the Hadramawt Governorate. It employs approximately 1000 people and its sales volume reached nearly YD 2.5 million in 1985. In general the woodworking sector produces low quality products at high costs. This can be attributed mainly to low utilization of equipment, poor maintenance of production facilities, low labour productivity and extensive use of expensive raw materials. Factories are often run without a sound orientation on the market requirements and subsequent production planning and organization lack long term perspective.

The present strategy of the People's Democratic Republic of Yemen towards industrial development, as reflected in the Third Five Year Plan, focuses on strengthening the industrial infrastructure. It concentrates on three types of measures: (a) increase the utilization of existing productive capacities, through the rehabilitation of selected factories; (b) the

establishment of a limited number of new factories to cater for the growing needs for indigenously produced goods, with a view to saving hard currency through import substitution; and (c) improving the production and managerial capacities in industrial enterprises. This project in the woodworking sector falls under the first and the last categories.

The first technical assistance to the woodworking sector in the People's Democratic Republic of Yemen was provided in 1978 through a review of the Aden Public Corporation for Carpentry. The review indicated various areas for improvement of production and management. In 1981, project PDY/81/006 'Training in Management and Efficiency Improvement in Industries' provided a consultancy mission to conduct a survey of the manufacturing facilities of the Coastal Carpentry Cooperative. The survey team's findings indicated the urgent need for technical assistance in relation to the cooperative's plan to consolidate the operations of three of its member units. Thus, in 1983, a three month mission was fielded to review this issue. This mission drew up the blueprint for a central workshop in Mukalla and advised on the necessary technical assistance to implement the plan. As no funds could be secured for this purpose, no follow-up was given by UNDP.

Two cooperatives are active in the Hadramawt Governorate: one in the area around Seiyun and one in the area around Mukalla. Each cooperative consists of a number of small scale production units, which supply their immediate environment with construction woodworking items (doors, windows) and selected furniture (beds, tables, chairs, sofas).

The cooperative of Seiyun has workshops in Tarim, Al-Hauta, Shibam and Seiyun itself. It employs 173 persons in various capacities, compared to 166 in 1977. The volume of sales of this cooperative was YD 644.348 in 1987 compared to YD 455.007 in 1982. Production is at an artisanal level, relying mainly on the individual skills of the carpenters.

The Coastal Carpentry Cooperative has workshops in Ghail, Mukalla and Shahr. The total number of employees was 366 in 1977 and 376 in 1987. Most of the people are employed by the central workshop in Mukalla. The sales volume of this cooperative in 1987 was YD 1.245.842. Production in the central workshop in Mukalla has industrial characteristics, particularly in the furniture production, but the other workshops are of the same level as those in Seiyun.

Annex II

Names of the expert's counterparts and
List of Persons met

Mr. Omar Badufari	General Director Ministry of Industry Mukalla Office
Mr. Mahfoud Baswad	General Manager Coastal Strip Carpentry Cooperative in Mukalla
Mr. Ahmed Fogehan	General Manager Carpentry Cooperative in Seiyun
Mr. Ahmed Al-Dugeel	Production Manager CSCC in Mukalla
Mr. Alwi Al-Jifri	Mechanical Engineer Counterpart in the project
Mr. Saleh Bayashoot	Production Supervisor Counterpart in the project
Mr. Awad Al-Akbary	English Interpreter and draughtsman
Mr. Khalid Mahfood	Production Planning staff
Mr. Saleh Amber	Designer in the CSCC in Mukalla
Mr. Agil Segaf	English Interpreter in Seiyun
Mr. Mohammed Besheer	Counterpart in Seiyun
Mr. Faraj Motran	Driver

The expert also contacted and worked with the majority of production supervisors, quality controllers, maintenance staff and all the managerial staff in both Cooperatives.

Annex III

Substantive Officer's Comments

The CTA has continued his useful work. The report is clear, the advice given is sound, but one gets the impression that the advice given in the past has been ignored. The CTA was more optimistic in the previous reports because he hoped that his recommendations would be implemented. This time, when the project is drawing to a close, he seems to have become demoralized, seeing that advice given that called for small changes have been implemented and the others ignored.

There is no doubt that the two months of saw doctoring expertise provided by the project are insufficient, but the training provided has been dissipated in Seiyun by the transfer of the persons trained to other duties.

Another problem that the project is facing is the fact that it was originally conceived that continuity would be ensured by the two UN Volunteers. These have completed their two year assignments and have not been extended, in spite of the fact that they were both evacuated during the Gulf War crisis and because of the fact that the effectiveness of the Volunteer stationed in Seiyun was slow during the start of the project, the tasks they were to carry out could not be completed in the time set, since some 20-25 percent of the time assigned was wasted for these reasons.

Serious thought should be given to recruiting technicians with a higher level of education and/or to invest in the education of the more promising of the Cooperatives' younger staff.

The training manual on sanding and surface finishing - issued separately - is yet another very useful and down-to-earth document that could be of use not only to the two Cooperatives receiving assistance, but could also serve as a basic textbook for other woodworking enterprises in the country and for vocational and technical schools.