

Repair and Maintenance Capability and Facilities Availability for MF 285 Tractor Operators in North of Khuzestan Province

Fatemeh Afsharnia, Mohammad Amin Asoodar, Abbas Abdeshahi, Afshin Marzban

Abstract—A repairable mechanical system (as agricultural tractor) is subject to deterioration or repeated failure and needs a repair shops and also operator's capability for the repair and maintenance operations. Data are based on field visits and interviews with 48MF 285 tractor operators from 14 villages collected in north of Khuzestan province. The results showed that most operators were lack the technical skill to service and repair tractors due to insufficient training, specific education and work experience. Inadequate repair and maintenance facilities, such as workshops, mechanics and spare parts depots cause delays in repair work in the survey areas. Farmers do not keep accurate service records and most of them disregard proper maintenance and service of their tractors, such as changing engine oil without following the manufacturer's recommendations. Since, Repair and maintenance facilities should be established in village areas to guarantee timely repair in case of breakdowns and to make spare parts available at low price. The operators should keep service records accurately and adhere to maintenance and service schedules according to the manufacturer's instructions. They should also be encouraged to do the service and maintain their tractors properly.

Keywords—Operators' capability, Facilities availability, Repair and maintenance, MF 285 tractors.

I. INTRODUCTION

WORLDWIDE, tractors are the main source of power in the farm, and represents a major component of farm fixed costs. If properly and given the necessary field maintenance tractors will operate for long period and do a great deal of work before major repairs are required [1]. The economic benefits from a tractor depend upon the efficient manner of its use [2]. Therefore, tractor should be maintained correctly to ensure effectively working for a long period without any breakdown and thus provide a much benefit to its owners. A tractor that breaks down and must be prematurely replaced incurs large expenses and wastes the investment. As an example, in developing countries approximately 53% of total machine expenses have gone to repair machine

Fatemeh Afsharnia is MS of Agricultural Mechanization Engineering, Department of Agricultural Machinery Engineering, Khuzestan Ramin Agriculture and Natural Resources University, Ahvaz, Khuzestan, Iran (e-mail: afsharniaf@yahoo.com).

Mohammad Amin Asoodar and Afshin Marzban are Professor and Assistant Professor of Agricultural Machinery Engineering Department, Khuzestan Ramin Agriculture and Natural Resources University, Ahvaz, Khuzestan, Iran.

Abbas Abdeshahi is Assistant Professor of Agricultural Economic Department, Khuzestan Ramin Agriculture and Natural Resources University, Ahvaz, Khuzestan, Iran.

breakdown as compared to 8% in developed countries [3]. The tractors are generally used for land preparation with very little use in other farm operations [4].

The use of tractors instead of hand tools and animal-drawn implements requires special management ability and skills as well as adequate service support facilities. However, the use of the farm machines in Riau Province has increased considerably without a corresponding program for training farmers and agricultural extension officials, and without sufficient service and maintenance facilities to support efficient and economic tractor use at the farm level. Under such circumstances, the average life of a machine therefore becomes shorter because it is difficult for farmers to repair tractors when they break down. A number of studies have reported the causes of a high breakdown frequency and a high repair rate [5]-[7]. The authors found that unskilled operators, poor operation and maintenance practices, and lack of spare parts were the main contributing factors. Untrained operator, for example, was found to be a major cause of high repair and maintenance costs in Pakistan [6], and improper handling by tractor operators caused frequent breakdowns in Nigeria [5]. Furthermore, failure of the regular supply of replacement parts for machinery and equipment in developing countries has often led to large numbers of agricultural machines remaining unserviceable for long periods [8]. Therefore, operators and mechanics should ideally be well trained and furnished with suitable maintenance and repair facilities. The manner in which the tractor is treated is also an essential factor to keep it in good operating condition. The purpose of the present study is to recognize the capability of tractor operators in performing repair and maintenance of MF 285 tractors, to identify the availability of service and repair facilities at the farm level, and to evaluate the manner of the operators in maintaining their tractors.

II. MATERIALS AND METHODS

A survey was conducted in north of Khuzestan province, Dezful city and its vicinity. These regencies were chosen for survey locations because of their high tractor uses and the importance of agricultural production which uses predominantly MF285 tractors to mechanize land preparation. A total of 40 tractors from 14 villages were selected randomly from lists of tractors in each village. The tractor operators (also farmers) were personally interviewed through home or workplace visits. Data were gathered from records and through verbal information on pre-tested questionnaires in

cases where farmer records were absent. Agricultural extension officers, local repair shop workers, and spare part shop owners were also asked to provide supplementary information. The tractor owners or operators were asked detailed questions covering repair and maintenance, daily checks, regular services, engine oil or lubricant service interval, fuel and lubricant consumptions, cleaning, greasing, and methods of protecting tractors during fieldwork and off-season. The data were tabulated and then analyzed using simple descriptive techniques including percentages and means.

III. RESULTS AND DISCUSSION

Based on the survey, it was found that twenty percent of the tractors were operated by two operators and the rest by a single operator. The total number of operators was 48 persons and about 20% of them were beginner. The operators varied in age (ranging from 18 to 52 years), educational level (ranging from no formal education to senior high school graduate), and work experience (ranging from 3 to 37 years).

The most operators can perform only the easiest levels of service and repairs presented in Table I. For instance, about 91% of the operators can perform minor services or adjustments on belts and clutch components. However, it was found that about 75% of the tractor operators have received no training or supervised experience in operating and maintaining tractors. Operators commonly learn mostly from other operators or are taught by family members. Most of the operators also have little education (illiterate and elementary school level). Illiteracy and the completion of fewer educational levels limit the ability of operators to study the operator's manual and to understand all the instructions.

Discussion with owners revealed that operators with five years or more work experience can perform major repairs or overhauls. It is clear that the poor technical knowledge and skills of the operators are due mainly to an inadequate training program conducted by the provincial government. There are some institutions provided by the government and other organizations for training tractor operators and mechanics in the Province, but the most of tractor operators do not follow these training programs. The existing training program is attended only by few farmers. Additionally, dealers and their agents do not provide adequate training related to tractor repair and handling at the time of sale.

TABLE I
 SKILL ABILITY OF OPERATORS TO TRACTOR REPAIR AND SERVICE

Service and Repair Items	Number of Operators	Percentage
Belts	37	92.5
Air Cleaner	36	90
Fuel Filter	32	80
Oil Filter	34	85
Changing Engine and Transmission Oils	33	82.5
Clutch	36	90
Wheel Bearing	10	25

Maintenance and repair facilities are not yet well developed in vicinity of Dezful City. Table II shows that very few repair and welding shops are available in the each regency. Existing shops are private repair shops. Most of the facilities are located in the regency capital, while tractors commonly operate in the village area. In Mianrood regency, one of the areas surveyed, workshops are available about 30 km from the village. In Benut-e Pain regency, the nearest repair shops are more than 15 km away. Consequently, most farmers frequently feel frustrated when faced with serious breakdowns due to inadequate repair facilities available in their village areas.

TABLE II
 AVAILABILITY AND DISTRIBUTION OF REPAIR SHOPS IN NORTH OF PROVINCE

Regencies	Type and Number of Workshops		Total
	Repair Shops	Welding Shops	
Tohid	1	10	11
Shams Abad	1	3	4
Benut-E Pain	0	0	0
Choghasorkh	0	0	0
Shalgahi	0	0	0
Choghasabz	1	1	2
Safi Abad	1	4	5
Montazeri	2	3	5
Motahari	1	1	2
Behrouzi	0	0	0
Pirouzi	0	0	0
Dezab	0	1	1
Siahmansour	1	2	3
MianRood	0	3	3

Table III compares the price of spare parts at the shops in the village area compared to dealers in the city capital, Dezful. As a consequence, farmers had to purchase spare parts, which were more expensive 21% at the shops near or within village area than at dealers. The long distance limited access to the city centers and consequently resulted in high transportation and spare parts costs in the village areas.

TABLE III
 PLACE OF PURCHASE AND PRICE OF TRACTOR SPARE PARTS

Type of Parts	Price in Purchase Places (US\$)	
	Dealer in City	Local Shops Near or Within
	Capital	Village Area
Belts	4.2	5.12
Nozzle	6.62	-
Piston (Plus Ring)	17.5	-
Bearing	5.42	-

Of the 558 breakdown cases, approximately 70% required minor repair, and the remaining 30% was in the major repair category. Table IV shows that most minor repairs could be performed on schedule, while about 10% and 25% cases were delayed due to inadequate repair and maintenance facilities and financial difficulty of the farmers, respectively. On the other hand, about 10% of the major repairs were delayed because of the lack of spare parts, workshops and mechanics in the village areas and about 10% were due to financial difficulty of the farmers. Also about 10% of the major repairs

could be performed according to schedule. Accordingly, some severely damaged tractors remained unserviceable for at least one crop season due to either the lack of spare parts or financial difficulty.

TABLE IV
REPAIR PROCESS OF TRACTOR BREAKDOWN AT FARM LEVEL

Repair Category	Repair Process (%)		
	According to Schedule	Delay	Financial Difficulty
Minor Repair	35	10	25
Major Repair	10	10	10

*: Spare parts, workshops, and mechanics.

Tractor operators are largely responsible for the daily checks and service of tractors. Service and maintenance practiced by the operators were investigated on the subject of daily checks and engine oil changes. Table V shows that only a minority of farmers performed maintenance on a regular basis. Hose leaks were maintained the most frequently by the farmers, while air cleaners and cooling water were maintained the least frequently. Other maintenance targets, such as oil levels, belt tension, fuel sediment bowls, and lubrication were only occasionally checked.

TABLE V
DAILY MAINTENANCE CHECKS PERFORMED BY THE FARMERS

Maintenance Checks	Number of Tractors	Percentage
Air Cleaner	6	15
Cooling Water	6	15
Bolts and Nuts	8	20
Loose or Damaged Parts	10	25
Leaks	15	37.5

Not all records of the servicing periods of the tractors could be known, so some service schedules were recalled from memory in cases where the farmers did not maintain records at all. Typical intervals between engine oil changes are presented in Table VI. Most farmers (85%) did not rely on the operator's manual for service interval schedules and only 15% of them followed the manual's instructions thoroughly. Additionally, farmers often use unauthorized sources for service interval schedules. Therefore this result coincides with Wertz et al. [9] who revealed that 42% of the farmers ignored the advice given in the manuals. The different distribution of maintenance practice between the two sets of operators may reflect differences in skill and education.

Referring to Table VI, it is seen that 30% of farmers scheduled service more frequently than recommended, while 55% of farmers waited longer than the scheduled interval between service events. However, the appropriate service interval time can be reduced by one-half where tractors are operated in extremely dusty or dirty conditions [10]. More frequent service is, of course, more costly, but the additional cost is expected to correspond to reduced engine trouble.

TABLE VI
FARMERS' SCHEDULE OF OIL SERVICE INTERVAL IN EQUIVALENT HOUR

Service Schedule	Equivalent Hour		Number of Tractors	Percentage
	Range	Average		
According to Operator's Manual	-	100	6	15
Less Than Operator's Manual	30-70	50.33	12	30
Longer Than Operator's Manual	120-330	186.63	22	55

Safety and distance from the house to the field are important considerations of farmers' decisions to shelter their tractors. During off-season, some of the farmers (22.5%) stored the tractors in a shed; other farmers put them on the porch (30%) and most farmers left them outdoors (47.5%) (Table VII). Unavailability of the shed was the primarily reason for tractors being stored outdoors.

TABLE VII
WAY OF STORING TRACTORS DURING OFF-SEASON

Storing Place	Number of Tractors	Percentage
Shed	9	22.5
Porch	12	30
Outdoor	19	47.5

According to the survey, the lack of attention of some operators towards tractor care and maintenance was, in fact, caused not only by poor skill and knowledge, but also financial problems. Such condition caused farmers difficult to perform good maintenance of their tractors. Some farmers, for instance, must leave their tractors outdoors even when they know the consequences of such action.

IV. SUMMARY

Based on the present study the following conclusions are drawn:

1. The capability of the operators to service and repair tractors is very poor due to insufficient training, specific education, and work experience. Inadequate repair and maintenance facilities were found in the survey area.
2. Inadequate spare part shops in the village areas raise the price of these parts. Farmers do not keep accurate service records and most of them pay little attention to daily checks, routine engine oil changes, and the need for periodic servicing. It is evident that about 85% of the farmers schedule engine oil changes without following the manufacturer's recommendation.
3. Some farmers also do not perform proper care and maintenance on cleaning, greasing, and protecting/storing during working and off-season. Financial problems also make it difficult for farmers to provide dedicated maintenance facilities for sheltering tractors.

ACKNOWLEDGMENTS

Authors hereby acknowledge and appreciate farmers' cooperation in Dezful city and its counties.

REFERENCES

- [1] Elbashir, A.H., *Tillage for sugar cane in Sudan with special reference to Kenana*. 1996, PhD Thesis, 1996 university of Khartoum, faculty of agricultural.
- [2] Rahmoo, S., H. Henderson, and G. Thierstein, *Costs of owning and operating tractors in Tharparkar District of Sind, Pakistan*.AMA, agricultural mechanization in Asia, 1979.
- [3] Inns, F., *Operational aspects of tractor use in developing countries a case for the small tractor*. J ProclnstAgricEngLond, 1978.
- [4] Salokhe, V. and A. Hendriadi, *Power tiller industry in Indonesia*. Agricultural Mechanization in Asia Africa and Latin America, 1995.26: p. 29-32.
- [5] Kolawole, M., *Economic aspects of tractor contracting operations in Western Nigeria*.Journal of Agricultural Engineering Research, 1972.17(4): p. 289-294.
- [6] Bukhari, S.B., *Evaluation of farmer's competence to maintain farm tractors*.AMA, agricultural mechanization in Asia, Africa and Latin America, 1982.
- [7] Babatunde, O., *An appraisal of the problem of wheeled tractors used in Nigerian agriculture*. Agricultural Mechanization in Asia Africa and Latin America, 1996.27: p. 23-26.
- [8] FAO, R., *Agricultural engineering in development: guidelines for rebuilding replacement parts and assemblies*. 1992.
- [9] Wertz, K., R. Grisso, and K. Von Bargen, *A survey of ag tractor service intervals—Part I*. Applied Engineering in Agriculture, 1990. 6(5): p. 537-541.
- [10] Jacobs, C.O. and W.R. Harrell, *Agricultural power and machinery*. 1983: Gregg Division, McGraw-Hill.