SOMALI DEMOCRATIC REPUBLIC
MINISTRY OF AGRICULTURE

MOGAMBO IRRIGATION PROJECT

REVIEW NOTE ON FANOOLE RICE PROJECT RICE MILLING FACILITIES

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SUMMARY

This note considers the consequences of using the rice milling facilities recently constructed at the Fanoole Rice Project (FRP) to mill rice produced on the Mogambo Irrigation Project (MIP) as an alternative to providing this project with its own milling facilities. The following main conclusions are reached:

(i) The processing capacity at FRP is insufficient to handle the entire crop production from the Mogambo Project.

(ii) The comparison of capital and running costs of the two alternatives given below clearly indicates the advantages of a separate mill for Mogambo.

COST COMPARISON

	Pound Sterling	As a Percentage of the Mogambo Rice Mill Capital Cost
Capital Cost with Rice Mill at Mogambo[1]	3 667 000	100
Capital Cost of using Fanoole Rice Mill	3 550 000	96.8
Capital Cost saving using Fanoole Rice Mill	117 000	3.2
Additional annual cost of operation and maintenance using Fanoole Rice Mill[2]	254 000	6.9
Present value of additional annual cost (discounted over 20 years at 10%)	2 162 000	59.0
Net additional cost of using Fanoole Rice Mill at present values	2 045 000	55.8

Notes: 1 Cost of Mogambo Rice Mill excluding the sun drying area and houses

2 Including only quantifiable costs

(iii) The loss of the husk fired power generation facility associated with the proposed mill at Mogambo would mean that unnecessary reliance would be placed upon the availability of imported diesel fuel for electricity generation, paddy drying and transportation, and involve considerable foreign exchange expenditure.

(iv) Management of the operations of the Mogambo Project would be severely, if not totally, constrained. The lack of control which would result from the imposition of the Fanoole operations and priorities would negate any attempts to apply management techniques to the Mogambo Project.

(v) There is no economic or practical justification for omitting the milling activities from the Mogambo Project. Indeed, there are compelling reasons for constructing the rice mill, together with a husk-fired power plant, at the Mogambo Project.

1. BACKGROUND

1.01 It was originally planned that the Mogambo Irrigation Project (MIP) would include the establishment of its own rice mill. Tender documents and specifications for the supply of the rice mill (Contract M2.4) were prepared during 1983. Advertisements were placed in a number of international journals inviting potential contractors to register their interest in October/November of the same year. From a recommended list of eight organisations prequalified, a total of six tenderers participated. The tenders were opened on 12 August 1984 and tender evaluation was completed by October. The evaluation recommended that a contract be finalised with F.H. Schule GmbH of West Germany, as the lowest evaluated tender.

1.02 During 1985 a rice mill, located some 45km from the Mogambo Project, has been constructed at the Fanoole Rice Project (FRP). In view of certain financial constraints, and the possibility of spare capacity at the FRP mill, it has been suggested that the MIP production may be processed there.

2. THE FANOOLE RICE MILL

2.01 The rice mill, of Chinese manufacture, is reported to have an input capacity of 6.25 tonnes per hour. It is planned that the mill will be operated on a single shift basis, and it is considered highly unlikely that, under prevailing operational conditions, an extra shift will be possible. Assuming mill operation of 250 days per year, a reported 10 hour operating day and 80% mill efficiency, a maximum of 12,500 tonnes per year could be processed. However, a 10 hour operating day is excessive for single shift operations. More usually a single shift represents an 8 hour day; were this the case the mill would only process about 10,000 tonnes annually.

2.02 On current projections, it is expected that total production at Fanoole, at project completion in 1988, would be approximately 10,000 tonnes. This figure is based on annual planting of 2,200 ha, at an average yield of 4.6 t/ha. Assuming 10 hours daily working, this would leave some 2,500 tonnes of spare milling capacity. If projected yields are reduced to an average of 3.5 t/ha, some 7,700 tonnes are required to be milled. On the same basis of 10 hours daily working, this would result in some 4,800 tonnes of spare milling capacity. If a single shift operation represents 8 hours daily, the spare milling capacity at a yield of 3.5 t/ha would be 2,300 tonnes, and if the yield reaches the projected 4.6 t/ha no spare milling capacity will exist. Current annual yield projections for Mogambo with double cropping are approximately 15,000 tonnes (7,500 tonnes per harvest) thus, at best, only a small proportion of the MIP production could be processed in the FRP rice mill.

2.03 For the FRP mill to be in a position whereby it could handle the entire production from both Mogambo and Fanoole, the plant would have to operate for over 5,000 hours annually. Such levels of annual usage are unheard of in any Developing Country. Rice mills in countries with an historically long tradition of rice production and processing such as Thailand and Burma, seldom exceed 4,000 hours annual milling.

3. CONSEQUENCES OF EXCLUDING THE RICE MILL FROM MOGAMBO IRRIGATION PROJECT

3.01 If the rice mill is not established at MIP, it would not be possible to incorporate the husk fired power generating equipment. The reason being that the fuel source, rice husk, as a by-product of the milling process would not be available.

3.02 The weighbridge and intake section would still be required as facilities for bulk weighing are necessary for stock control purposes - raw material from the farm entering the complex, and dried pre-cleaned grain leaving for further processing. No reduction in the original scope of supply would be possible.

3.03 As the raw material is likely to be harvested during periods of high relative humidity, together with the necessity of harvesting grain at the most expedient moisture content to ensure the maximum possible yield, it would be necessary for raw paddy to be dried to safe storage levels immediately after harvesting. Prior to the drying process it would be essential to ensure that the raw material has been thoroughly pre-cleaned. The principal reasons being: a) for reasons of drying efficiency and to ensure that clogging or choking of the drying column does not occur, and b) the presence of foreign matter in the stored grain would increase the incidence of storage losses. No reduction in the original scope of supply would be possible in the pre-cleaning section of the plant.

3.04 As the heat source for the drying process would be restricted to oil burn alone, a spare burner must be supplied as insurance against possible malfunction. With raw material entering the plant at a moisture content between 18-20%, immediate drying would be essential. If for any reason drying is delayed, both qualitative and quantitative losses would immediately result. Furthermore, storage of field wet grain is impossible. Therefore, should the drying process not be continuous, it would be necessary to cease the harvesting operations. This would disrupt further field operations. As the drying operation would be restricted to oil burn (under the modified original design oil consumption would be minimal as the heat would be provided from the husk fired power generating unit), substantial quantities of diesel oil will be consumed. It would therefore be necessary to increase the diesel oil storage capacity.

3.05 The rationale used when originally designing the grain storage capacity was based on procedures whereby total storage demand was minimised by maximum milling during the harvest period. The harvest at both MIP and FRP will coincide, and it has to be expected that FRP production would take processing precedence. It is therefore essential that MIP has sufficient available storage facilities for an entire harvest of about 7,500 tonnes. For this to be achieved, the silo storage would need to be increased by approximately 55%.

3.06 With the complex designed for bulk handling, it would be necessary to establish bulk loading facilities for delivering stock from the storage silos to road transport. These facilities were not required for the original design and would therefore have to be added to the scope of supply.

3.07 With the exclusion of the husk fired power generating equipment, it would be necessary for the project to generate electricity with diesel generating sets. Without the rice mill, the total power requirement for the complex, including small power, lighting, etc., would be approximately 200kW. To allow a sufficient margin for security, a generating set of, say 250kW maximum output would be required. With in situ generation being the only source of electrical supply, and with continuity being essential particularly during the harvesting/drying periods, a standby generating set would be required. With diesel being the only available fuel source, the requirement for additional fuel storage is apparent (under the original design, the generators were for standby purposes as the primary supply was from the husk fired power generating unit). However, such additional fuel storage as required, would be incorporated in that for the drying section (see Para 3.04 above).

3.08 The FRP is located some 45km from MIP. MIP management would, by having to move about 15,000 tonnes of paddy annually, be entering into a substantial transportation operation. In a country like Somalia it would be wrong to introduce a fleet of vehicles which are hitherto unknown as many problems related to servicing and maintenance, the availability of essential spares, etc., would result. In order to outline plan and cost the required fleet, we have taken as a standard the "Iveco-Fiat 682/N3" tipping truck, which is capable of transporting 9 tonne loads and is already being supplied to the Project under Contract M4. Some 15,000 tonnes per annum therefore represents approximately 1660 round trips. It is assumed that the transportation operation could be achieved over a 100 day per year period. This is considered reasonable having due regard to the MIP cropping pattern and the liklihood of FRP exclusively using their facilities until their own stocks are exhausted. It is unlikely that one vehicle could achieve more than two round trips daily. On this basis 8 vehicles are estimated as being required (if no allowance is made for major breakdowns). Necessary spare parts would also have to be provided. The existing workshop at MIP is suitably equipped to handle regular maintenance and repair, therefore no additional workshop facilities are required.

3.09 The transportation operation inevitably leads to additional handling as there will be a need to load from MIP storage to vehicles, and unload at FRP from vehicles back into store. The additional handling, transportation and second storage operation will lead to additional unavoidable post-harvest losses. It is difficult to accurately quantify such losses, however, a recent FAO study in Indonesia demonstrated that transportation losses alone are significant. With the additional movements involved in processing at FRP, it is estimated that losses in this operation alone could be in the region of 1-2% (150-300 tonnes annually).

3.10 By allowing MIP production to be processed in the FRP facility, Mogambo management would have no control over this important process. It must be assumed that the processing of MIP stock would take place only after FRP's own production has been handled. Therefore, any problems related to the FRP installation could well have a severe effect on the smooth operation of the Mogambo farm. For example, if a season's harvest were not cleared before the onset of a subsequent harvest, field operations could be delayed and thus disrupt the whole cropping calendar.

4. CAPITAL COSTS

(a) Plant

4.01 The 4.0 tonne per hour rice mill, including husk fired power plant and all associated facilities, at the time of tender submission, had a capital investment cost of £1,772,796 (equivalent to SoSh 46.8 million). A further £7,686 must be added to this to allow for the heat exchanger. Also as the finalization of a contract has been delayed, increasing the price by 3% per annum, will bring the current capital cost to £1,833,897.

4.02 The capital cost, includng the 3% price increase, of establishing facilities without the rice mill and steam power plant, assuming that no further investment would be necessary to enable FRP to process MIP production, is £1,657,302 (see Appendix I).

(b) Civil Works

4.03 The associated costs for civil works (foundations, etc.) for the 4.0 tonne per hour rice mill were estimated in January 1985 to be SoSh 38,219,360, equivalent to around £1,833,000. This figure is for the rice mill civil works excluding the sun drying area and any houses, and allows for construction of the rice mill to be carried out after the scheduled completion of the Irrigation, Drainage and Flood Protection Works Contract.

4.04 Should the rice mill not be constructed, cetain basic changes to the civil works are required. Allowing for deletion of the rice husk silo foundations, increasing the foundation area for the paddy storage silos by 55%, and reducing the rice mill shed foundations by 60%, would have the net effect of increasing the cost of the civil works by approximately £60,000. No other major changes to the civil works quantities are anticipated.

(c) Effect on total Capital Costs

4.05 If it is decided not to mill the MIP production with the Project's own facilities a capital cost saving of about £117,000 would be realised, taking into account changes in costs for both the plant and civil works. As a proportion of the total rice mill capital cost this potential saving amounts to only 3.2%. However, this small saving must be balanced against the substantial increase in annual operation and maintenance costs.

5. RECURRENT COSTS

5.01 The total quantifiable annual recurrent costs incurred as a direct result of milling MIP production at the Fanoole project as opposed to at a mill located at the MIP Project Headquarters, is estimated at £253,850. This figure assumes that diesel oil would all be procured at the official Government price of SoSh 10 per litre (equivalent to £0.22 per litre). However, should the official price increase, or should the project be forced to purchase diesel at other than official Government outlets, the annual recurrent costs would rise accordingly. Diesel fuel in Somalia is currently in very short supply and this is reflected in its price of around SoSh70 per litre from private outlets. For details of recurent cost calculations, please see Appendix II. The present value of the additional annual recurrent costs, discounted over 20 years at 10% is £2,162,000.

5.02 The most substantial recurrent cost is incurred by the transportation operation. Allowing for vehicle depreciation, regular maintenance and overhaul, and the purchase of fuel and essential spare parts, this single operation would incur annual expenditure in excess of £200,000.

5.03 Diesel fuel requirements for the drying process and electricity generation would exceed 233,000 litres annually. This figure does not take into consideration the transport fuel requirements which would be substantial. The transport fleet is expected to cover over 150,000 km annually. The recurrent annual costs for drying and electricity generation, at the official Government diesel price, would be £38,350 and £13,000 respectively.

5.04 Unquantifiable annual recurrent costs include extra handling and milling charges. The additional extra handling charges are expected to be minimal as the operation would be largely mechanical. However, milling charges levied by FRP are expected to significantly exceed the costs which would have been incurred had MIP had its own mill. The principal reasons for this are that even though both projects are Government owned, they are both financially accountable. As such the FRP will wish to show a profit on the milling operation. Furthermore, as the FRP does not have husk fired power generating equipment, with all the benefits of a free fuel source, electricity generation charges would be significant and would have to be passed on to MIP.

6. COMPARISON OF COSTS

6.01 Using the figures for capital costs detailed in section 4 of this note, and the annual recurrent costs given in section 5, the following table can be produced in order to compare the costs of a rice mill at the Mogambo Irrigation Project against the alternative of milling the Mogambo harvests at the Fanoole Rice Project mill.

COST COMPARISON

		Pounds Sterling
(a)	Rice Mill at Mogambo[1]	
	Capital cost of plant	1 834 000
	Capital cost of associated civil works	1 833 000
	Total capital cost	3 667 000
(b)	Milling at Fanoole	
	Capital cost of plant at Mogambo	1 657 000
	Capital cost of associated civil works	1 893 000
	Total capital cost	3 550 000
(c)	Capital cost saving using Fanoole Rice Mill	117 000
(d)	Additional annual cost of operation and maintenance using Fanoole Rice Mill[2]	254 000
(e)	Present value of additional annual cost (discounted over 20 years at 10%)	2 162 000
(f)	Net additional cost of using Fanoole Rice Mill at present values	2 045 000

Notes

1. Cost of Mogambo Rice Mill excluding the sun drying area and housing.

2. Including only quantifiable costs.

3. Costs rounded to the nearest £1,000.

CAPITAL COSTS OF PLANT

WITHOUT RICE MILL

Unit: £ Sterling

Item Nr.	Description	Plant	Erection	Total	Foot Notes
1	Weighbridge and Intake	35 018	4 744	39 762	1
2	Pre-cleaning Section	70 095	13 026	83 121	2
3	Drying Section	240 199	31 069	271 268	3
4	Paddy Storage Section	311 186	73 706	384 892	4
5	Bulk Truck Loading Facilities	56 619	11 364	67 983	5
6	Power Generating Equipment	56 731	4 744	61 475	6
7	Electrical Works	61 242	22 770	84 012	7
8	Steel Framed Buildings	60 207	19 018	79 225	8
9	Miscellaneous Items	67 899	34 497	102 396	9
10	8 Nr. "Iveco-Fiat" tipping trucks @ £32,900 each	263 200	-	263 200	10
11	Spare Parts for 10 above	36 848	-	36 848	11
12	Initial Operation and Training			11 743	12
13	Provisional Sums			123 106	
			SUB-TOTAL	1 609 031	
	Price increase caused by delay in finalizing Contract @ 3% per annum			48 271	
				1 657 302	

Footnotes

1. See Priced Schedule 1 of F.H. Schule tender, August 1984.

2. See Priced Schedule 2.

3. See Priced Schedule 3. Amount increased by 5% to allow for the supply of additional oil burner, large capacity fuel tanks, etc. (See para 3.04).

4. See Priced Schedule 4. Amount increased by 55%. Bulk storage requirement increased from 4,800 tonnes to 7,500 tonnes. Increase necessary because of no milling during harvest period (see para 3.05).

5. Bulk loading facilities required to deliver stock from storage silos to bulk trailers. Individual items required as follows:

Elevator	(Schedule 4 - Item 4/1)	£ 8,470
Holding Bin	(Schedule 2 - Item 2/7)	£ 31,852
Weigher	(Schedule 2 - Item 2/6)	£ 9,134
Dust Collector	(Schedule 5 - Item 5/5)	£ 3,163
Switchboard	(Consultant estimate)	£ 4,000
		£ 56,619

Erection charges are based on those for the pre-cleaning section - similar installation and capital cost.

6. See Priced Schedule 6. Two generating sets are required (see para 3.07).

7. See Priced Schedule 7. Amount reduced by 20% as under this option the rice mill is not required.

8. See Priced Schedule 8. Amount reduced by 50% as no mill house would be required. However, a building would still be required for the pre-cleaning and drying sections, office, laboratory/workshop and stores and a covered loading area would have to be provided for the bulk loading facilities.

9. See Priced Schedule 9.

10. A total of eight vehicles would have to be provided for the transportation operation (see para 3.08).

11. Spare parts for the tipping trucks have been included at approximately 14% of the capital cost. This amount will purchase spares for an operational period of about 2 years.

12. See Priced Schedule 10.

13. See Priced Schedule 11.

ANNUAL RECURRENT COSTS

A. Transportation

Some 15,000 tonnes of paddy rice is to be transported from MIP to FRP annually. The overall distance between the two projects is 45km. Therefore, the annual transportation requirement is 675,000 t.km (15,000 tonnes x 45km).

Transportation costs in Somalia vary substantially, we have therefore examined existing contracts under this project. For bulk transportation under Contract M1 (Buildings & Services), a tonne-kilometre rate equivalent to £0.38 is applied. For Contract M2 (Irrigation), the rate is £0.22. It would appear reasonable to take an average of these two rates for calculating the recurrent annual transportation costs. The average would therefore be £0.30 per t.km.

675,000 t.km @ £0.30 = £202,500 per annum.

B. Electricity Generation

Under the original design it was anticipated that all electricity would be generated on site by the husk fired power generating unit. Fuel for this source would have been free as the rice husk is a waste agricultural by-product of the milling process. Without the rice mill this free fuel source will not exist, and therefore all electricity would have to be produced by diesel generators.

The installed load for the weighbridge, intake, pre-cleaning, drying, paddy storage and bulk vehicle loading sections would be approximately 180kW. Allowing an additional 20kW for small power, lighting, etc., the total required load would be approximately 200kW.

The major items of plant would be expected to have an annual utilization of approximately 1,660 hours.

To allow a sufficient margin, with some spare capacity, a generator set with a maximum output of 250kW would be used. The fuel consumption of this unit, at full load, is 44.5 litres/hour. Allowing a 20% reduction for average load conditions, the actual fuel consumption becomes 35.6 litres per hour.

Diesel fuel is regularly in short supply in Somalia. This is reflected in the substantial price differential between the official Government price of SoSh 10 per litre, and the parallel economy (private market) price of SoSh 70 per litre. The official rate is equivalent to £0.22 per litre at current published exchange rates.

At the official Government rate, the diesel fuel costs for electricity generation would be as follows:

1660 hours x 35.6 l/hr x £0.22/l = £ 13,000 per annum

C. Fuel for Drying

Under a modification to the original design it was anticipated that the waste heat from the husk fired power generating unit (steam motor would be passed via a heat exchanger to allow for heating the ambient air for the drying process. Sufficient waste heat is available to cover all the drying requirements. However, without the husk fired power generating unit all heat must be provided by burning oil.

The dryer would be operated for approximately 1,660 hours annually. The hourly diesel fuel consumption for this unit is 105 litres.

At the official Government rate for diesel oil, the fuel costs for drying would be as follows:

1660 hours x 105 l/hr x £0.22/l = £ 38,350 per annum