Village Access Road Construction in Yemen

by the Social Fund of Development

Introduction

Yemen is a rural country of about 530,000 km^2. 75% of the population of 17 million reside in villages or clusters of homes. 90% of the population is concentrated in mountainous areas. Agriculture is the major aspect of Yemen's economy and employs about 60% of its labor force. The majority of agriculture family-based substance farming. The highlands contain elaborately built terraces of ancient origin that often extend from the edge of wadis to the mountains tops. Agricultural output is primarily qat, cereals, vegetables and fruits. Yemen's topography and habitation patterns present challenges in establishing a suitable road network providing access to the population.

Transport

Yemen's road network consists of about 70,000 km of roads (6,200 km of asphalt roads, 2,900 km of gravel roads, 2,200 km of urban roads and around 60,000 km of feeder roads). Feeder roads are tracks or earthen roads. Most of the feeder road network was constructed during the 1970's and 1980's by Local Development Associations.

Population

Yemen's 17 million people live in about 106,000 residential groupings. Compared with other countries, this figure is extremely high.

It is evident that if all these groupings desire access to facilities and services, the required road network will be enormous. If the average access road length is only 5 km per residential grouping, a total of 530,000 km of roads are needed. The existing 60,000 km of feeder roads would need to be expanded by 470,000 km.

Scope of Intervention

Projects to improve accessibility of rural or poor urban areas and eligible for funding include:

- Constructing feeder roads including the realignment of steep sections, widening the carriageway, and construction of drainage structures and protective works using labor-intensive techniques (small bridges, drifts, Irish crossings, box culverts, retaining walls, masonry ditches, etc.);

- Improving access to villages to facilitate the construction of other village interventions (water supply, dams, health units) by renting earth-moving equipment from local authorities or the private sector, augmented with local labor in order to increase the impact of the facilities provided;

- Constructing paved roads using rocks found in wadis. This is a well-established technique for road construction in the Hadramawt region executed by experienced construction crews coming mainly from Tarim;

- Improving the surface layer of selected stretches of existing roads using rock paving blocks or stones;

- Constructing stone pavement in market places and footpaths in urban areas.

Prioritization of Eligible Projects

Since SFD receives hundreds of requests for feeder road projects, a selection tool was established in 2000 that is transparent, accurate and fast. Furthermore, this tool allows an initial screening of sub-projects without visiting the project area. The following essential and easily verifiable criteria are used:

- Poverty level of project area;
- Population benefiting (directly and indirectly);
- Economic capabilities of the beneficiary committees;
- Access to infrastructure (water supply, education, health);
- Remoteness;
- Suitability as road network extension;
- Per capita cost (type of terrain, existing transport facility, length).

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Al Salaf Road, Al Mawasit District, Taiz Governorate

SFD road visited on 23 February 2004.

The terrain is extremely steep. This forced the design engineer to choose a road gradient of 18 % and more over about 75 % of the road length. Such sections must be built with a stone pavement layer to avoid excessive erosion of the road surface and thus high maintenance cost after every rainy season. In appropriate intervals, drifts have been placed as outlets for the side drain water. In addition, a high number of retaining walls had to be built to maintain the standard road width of 3.5 m and to construct hairpin bends (HPB) that allow the driver to manage the curve without manoeuvring back and forth.

The quality of the works is of high standard (see pictures below).

Technical data

- road length 2.7 km
- 1 lane road
- escarpment terrain
- completed 23.6.2003
- steep sections with stone pavement
- actual cost USD 84 415 (incl. consultant cost)
- cost/km USD 31 265 (incl. supervision)

Socio/economic data

- access to 11 villages
- labour intensity of construction 51 %
- community contribution USD 3 300
- 3 502 direct beneficiaries
- 4 502 indirect beneficiaries
- cost/capita USD 14.7 (indirect beneficiaries are counted half)

Impact data

	person transport YER	car rent YER	flour transport YER	sugar transport YER	gaz bottle transport YER
before	300	4 000 - 5 000	250	250	150
after	100 - 150	2 000	150	150	50

	travel time minutes	traffic density no.	HPB manoeuvr. no.	vehicle type	water tank transport
before	90	1 (4WD)	2 - 4	4WD	impossible
after	20	5 - 6	0	all	possible

hairpin bends with stone paved surface

dry stone masonry retaining wall

Naqil Al A'adhabea, Sharaab Al-Salam District, Taiz Governorate

SFD road visited on 24 February 2004.

The terrain is mountainous to rolling. After a steep ascent of about 350 m, a pass is reached. Then, the road descends gently through a wide valley with extensive Qat plantations. The technically difficult and steep ascent with many hairpin bends is well aligned. The road gradient could be kept below 18 %, thus avoiding the need for stone pavements. However, a number of high and long retaining walls had to be built in the upper part of the ascent to gain the required road width. Drifts as well as some box culverts were constructed as per the quantity of run-off water collected in the side drains.

The quality of the works is of good to high standard (see pictures below).

Technical data

- road length 13 km
- 1 lane road
- rolling/mountainous terrain
- completed 13.4.2003
- steep sections with stone soling
- actual cost USD 118 000 (incl. consultant cost)
- cost/km USD 9 077 (incl. supervision)

Socio/economic data

- labour intensity of construction 48 %
- community contribution USD 5 600
- 12 500 direct beneficiaries
- 4 383 indirect beneficiaries
- cost/capita USD 8.0 (indirect beneficiaries are counted half)

Split of construction cost (%)

Beneficiary contribution	Labour	Equipment	Materials	Stones	Explosives	Others	Total
4.2	48.4	26.3	10.9	7.1	1.6	1.5	100.0

box culvert

long and high retaining wall

Jabal Henwab Road, Khadeer District, Taiz Governorate

SFD road visited on 25 February 2004.

The terrain is moderately steep to steep. There are a number of sections with a gradient of 18 % and more that had to be reinforced with a stone pavement layer. Cross drainages have been well chosen so that the side drain water is discharged into the available natural gullies. Where the road runs along steeper slopes some retaining walls had to be built to maintain the standard road width of 3.5 m. In addition, hairpin bends also had to be designed that allow the driver to manage the curves without manoeuvring back and forth.

The quality of the works is of good to high standard (see pictures below).

Technical data

- road length 15 km
- 1 lane road
- rolling/mountainous terrain
- completed 23.6.2003
- steep sections with stone pavement
- actual cost USD 130 427 (incl. consultant cost)
- cost/km USD 8 696 (incl. supervision)

Socio/economic data

- access to 37 villages
- labour intensity of construction 45 %
- community contribution USD 9 500
- 7 502 direct beneficiaries
- 5 000 indirect beneficiaries
- cost/capita USD 13.0 (indirect beneficiaries are counted half)

Impact data

	person transport YER	car rent YER	flour transport YER	sugar transport YER	gaz bottle transport YER
before	250	3 500 - 4 000	200	200	100
after	100	1 500 - 2 000	100	100	50

	travel time minutes	traffic density no.	HPB manoeuvr. no.	vehicle type	water tank transport
before	120	1 - 3 (4WD)	1 - 3	4WD	impossible
after	30	7 - 8	0	all	possible

drift as cross drainage

village school with mixed classes at road end