

## 第Ⅵ章 意見及び勧告

### 1. 開発調査(F/S)候補地区

農業開発を目的とした水資源開発を行なう場合にまず考えなくてはならない事項は、農業開発を優先する諸条件を検討する必要がある。即ち食糧生産の増大による国内供給力の向上、輸出農産物の増加拡大、農業就業機会の拡大安定に伴う国民経済的な便益増加、国内の地域的发展過程における地域間隔差の是正等の国内外の社会経済とのかゝり合いを明確にしておく必要がある。

また、農業開発のための小資源開発の可能性は地域毎の水文収支から割り出したところの未利用の賦存量の大きさと、農耕適性土壌の存在が大きな因子であり、両者の一致または後者が大きい場合に始めて実現性への模索にに移せる。従ってこのような観点から調査団は、① ワジ、ジジ地区、② ルスタック地区、(ワジ、バニカルス、ワジファー)、③ ミスファ地区、④ ニツワ地区、⑤ ワジ、スマイル地区、⑥ シャルキヤ地区、⑦ アイン、サハノート、⑧ アインガルジジ、⑨ アインアルザット、⑩ ワジ、ダルパートの各現地及び企業農業、個人農業の実態、農産物の集荷、加工工場並びに各種試験物、政府地方機関等について素通りの短期調査を行ったが、調査団の各専門家の意見は各地区について次のように結論づけた。

- ③ ミスファ地区は農村整備計画が考えられるが、規模は小さく、我が国の開発調査として取り上げにくい。
- ④ ニツワ地区は古くから開発されており、取水方式の統合及び導水、取水の改良及び既耕地の整備等の両開発は今後の課題であるが、新規開発の適地はみあたらない。
- ⑤ ワジ、スマイル地区は、既に水資源局によって水資源開発計画が樹てられていること。また首都圏に近いことから将来は都市用水源として活用されると推定されること等から農業開発地域としては不適當である。
- ⑥ シャルキヤ地区は広大な農耕適性土壌が存在し、水資源の可能性があれば農業開発としては最も適した地区であるが、既に農漁省が調査対象地区として選定し、井戸による開発調査に着手し第2段階に入っていることから開発調査候補地区から除外すべきと判断した。

以上の諸点を考慮して調査団としては

- A. ワジ、ジジ地区における農業水資源開発。
- B. ルスタック地区における農業水資源開発。
- C. サラーラ平野における農業基礎調査及び、農業開発マスタープラン。

以上3地区を開発協力しうる地区と選定した。上記地区についての利点及び問題点を記すと次のとおりである。

## A. ワジ, ジジ地区

バチナは山岳部があり且つワジが無数に発達しており、年間数回は大量の水が洪水となって流下していることは確率からみても断言できる。したがってワジの河床部には信頼しうる伏流水があることは確かであり、この流水を有効に取水しようとする構想を描くことが出来る。従ってバチナでの調査は流域を限定し、この流域内の水文循環を明らかにし、余剰水の開発、水源転授等の計画についての調査を行い、井戸またはファラジーによる水利用形態から一步脱皮した形での開発を進めたい。

### 地区の利点

- ① 水資源開発のための地下構造物設置に適した地形、地質であると推測される。
- ② ソハール周辺（特に国道の西側）に開発適地が存在する。
- ③ 調査サイトまで舗装道路が完備している。
- ④ 近隣には現在利用されているファラジーがない。
- ⑤ 農業局、水資源かんがい局の支所がソハールにあり、協力態勢が容易である。
- ⑥ バチナ地区に無数に存在するワジ開発のモデルケースとしての波及効果が推測される。

### 地区の問題点

- ① 特にないが水収支のバランスが負となっていると推定されている。
- ② 海岸地帯の浅井戸に与える影響

## B. ルスタック地区

ワジ, ジジ地区と同じく下流域には無数のワジが発達しており、洪水が多いことは言うまでもない。したがって付近一帯にファラジが発達していることから河床部における伏流水はワジ, ジジよりかなりの量があるといえよう。しかし新規利水によるファラジ間のトラブルはさけることは出来ないので調査は綿密かつ慎重に行う必要がある。

### 地区の利点

- ① 地下ダム建設に最適な地形と地質があると推測出来る。
- ② 首都圏に近く、野菜等の都市近郊型農業開発に適する。
- ③ 工事用の主要資材の搬入に当っては首都圏に近く有利である。
- ④ 舗装道路も近くに整備される。

### 地区の問題点

- ① ワジバニカルス, ワジファーには多数のファラジがあり、地下ダム建設による影響予測の推定及び調査に多くの日時費用を必要とする。
- ② 既設取水設備の補償問題が考えられる。

- ③ ダムサイト周辺の農業適地は既に開発されている。

### C. サラーラ地区

サラーラ地区はパチナ地域のようにワジ毎に区分した水系毎の水収支による水資源開発計画ではなく、サラーラ平野とその背後の山岳を含めた、地下水脈の構造解析により地下水状況を明らかにしたうえで、水資源開発可能量を推定し、地下水開発を制御していく、開発基本計画調査的な性格をもつ調査となる。

#### 地区の利点

- ① この国の中では気候的に最もめぐまれた地区で農業に適している。
- ② 広域な基礎調査が殆んどなされていないため協力効果が大い。
- ③ 地下水脈は泉等の実態からしてかなりの量が期待される。
- ④ 山岳部は草地として利用されているが水源涵養事業の可能性がある。
- ⑤ 農業局、水資源かんがい局ともにサラーラに支所をもち、協力態勢がととのっている。
- ⑥ 大きなワジがないことから山岳、山裾、平野と分けられ大規模開発プランの策定の可能性は水資源の賦存量にかゝっている。
- ⑦ 政府の要請が強い。

#### 地区の問題点

- ① 首都から離れている。
- ② 治安上重要地域で調査活動に制約があると推定される。

上記のとおり集約したがAとCについてはいずれも甲乙つけがたく強いて順位をつけるならばA、C、Bの順位になる。

## 2. 農業・水資源開発に関する意見

(1) 農業生産の向上、及び農業労働力、野菜、果実はオマーン国では食糧輸入の中で大きな割合を占めている。特に野菜は一部の作物を除き栽培期間が限られており、また保存期間が短期であること等から乾期には多量の輸入となっている。したがって乾期と雨期の野菜の価格差は10倍に及び、国家経済上のみならず、家庭経済上からも重要課題である。

しかしオマーン国は南北気象のパターンが異り、冬期に北部で野菜の生産、夏期に南部で野菜の生産をすることにより貿易収支の改善はもとより、農業の生産性の向上が可能となる。幸い、現在第1次5ヶ年計画の一環として、サラーラとマスカットを結ぶハイウェイが建設されつゝあり、完成もま近いことから流通機構の整備、野菜の輸送体制、等について早急に調査、整備の必要がある。

この国における社会開発のめざましい進展により農業はなれがはげしくなっているようであるが、この為には農業の機械化が緊急課題であり又機械化の為の圃場の整備もともに考える必要がある。特に乾燥地農業としての特色である mixed farming が進んでいることから区画の大小、作付体系の適性化が機械化農業の促進につながる。

## (2) 農業技術の改良と普及

既耕地の土地生産性を高めるためには、土地改良、施肥技術、病虫害防除、品種改良、作物貯蔵法などの試験研究を強化する必要がある、また現時点における農業は主として自然環境下での生産活動であることから、地域の風土に適した試験研究をする必要がある。この為には農業試験の研究施設の整備拡充が望まれ、場合によっては日本流の試験場なり、普及センターについての技術援助の方策も一考に価する。

## (3) 畜産振興と飼料作物の生産向上

沙漠地方では、昔からベトウインの遊牧が畜産業の慣行とされ、今日でも依然としてこの傾向が残っている。一方国営の大規模酪農経営が順調に推進されかなりの成果をあげている。したがって今後は、家畜の疫病対策が充分対応出来るよう畜産試験場の強化と獣医の養成が急務であり、また遊牧による畜産業の計画的な施策としての家畜数のコントロール及び草地の計画的確保並びに草地改良による飼料の増産計画等が大きな課題である。

## (4) 水資源開発

この国の水資源開発を促進するうえから最も重要な問題は国土の地形図（5万分の1）を早急に作製することが大きな課題であり、さらにワジの伏流水を含めた流量観測所の設置及び雨量観測所を充実し、全てについてレコーダを取りつけ水又データーの年次報告を行う必要がある。この為にはデーターの収集、分析の為の人材の養成と組織の確立が必要である。

## (5) 洪水貯溜について

| 区 分           | バチナ             | ドハール           |
|---------------|-----------------|----------------|
| 地下水利用（未開発を含む） | 百万立方メートル<br>303 | 百万立方メートル<br>24 |
| 湧水            | —               | 7              |
| 地下への流失        | 32              | 6              |
| 表流水の流失        | 56              | 115            |
| 計             | 391             | 485            |

オマーン国の調査によると年水収支は表のとおりとなっており、今後の水資源開発としては地下水の利用を考えている。このうち地表水の利用については全量の15.4%となっており、その利用如何によってはこの国の水資源の開発に大きく貢献する。

そこで具体的に利用する方法について最も簡易な工法として下記4点を提案する。

- ① 低堰堤によりせきとめ、大規模な土側溝を設置し地下浸透を図る。
- ② ワジを中心として枝状に大規模な土側溝を無数に設置し地下浸透を図る。
- ③ ワジと直角に浸透を各所に設置し、強制的に地下浸透を促進させる。
- ④ フトン籠によりせきとめ大規模な土側溝を設置し地下浸透を図る。

上記工法についてワジ、ジジの洪水量についての対応を考えてみることにする。

ワジ、ジジについては記述したとおり年に10回程の洪水があり、通常起りうる流量は152 l/sとなっている。この量の持続時間を1日とすると、

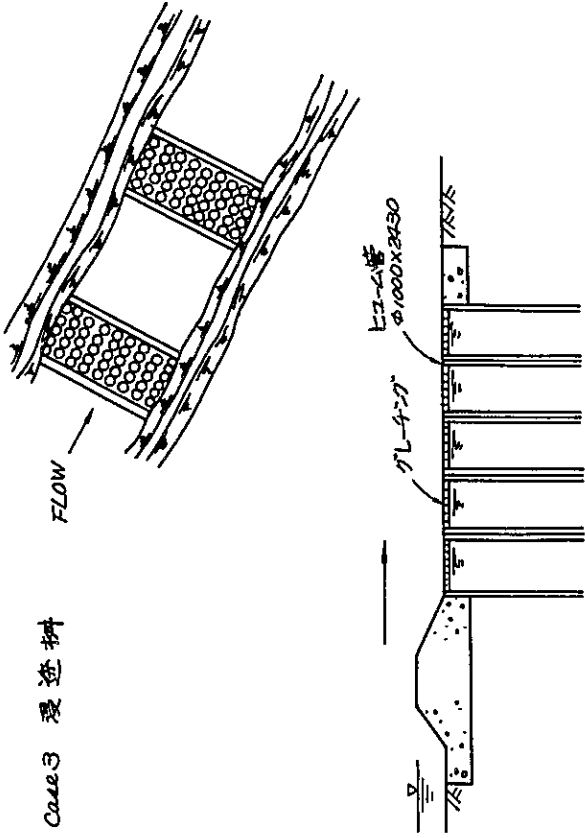
$$\begin{aligned} \text{1日の流量 } V &= 152 \times 86,400 \times \frac{1}{2} \\ &= 6,566 \text{ m}^3/\text{day} \end{aligned}$$

となり、この水を拡散又は地下浸透を図ることとすると Case 1 及び Case 2 並びに Case 4 は地下浸透用の（断面積  $24 \text{ m}^2/\text{n}$ ）貯溜水路を 274 m 設ければよいこととなる。また、耐用年数を素堀 1/10 その他は 1/40 にすると  $1 \text{ m}^3$  貯溜する為の建設コストは Case 3 が最も安価となる。しかしこの場合は上流から流下する土砂により埋没するおそれもあるので、Case 4 における本工事を Case 3 の上流サイドに設置すればより安全かつ有効に貯溜、浸透が図れる。

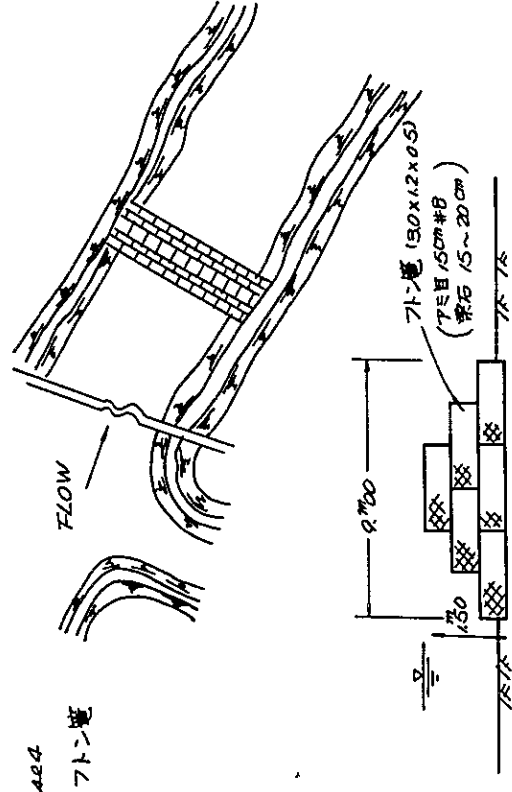
上記に述べた事項については川の性質、地質の把握等の不完全及び水文データの不足等を承知のうえでの試算であるので、今後本格的事業計画の立案に当たっては、現地に即した最適工法を決定する必要がある。

なお貯溜中の蒸発については浸透係数  $K = 6 \times 10^{-3}$  と仮定すると年蒸発量 3,000 mm として大した問題はないので省略した。

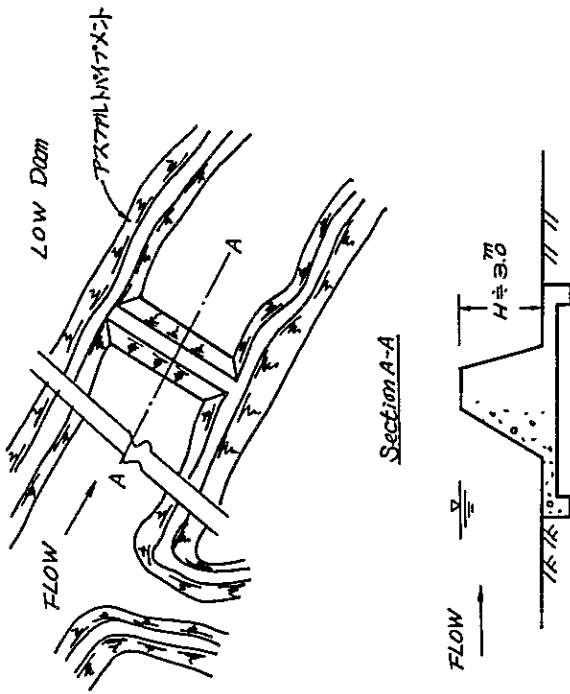
Case 3 覆造柵



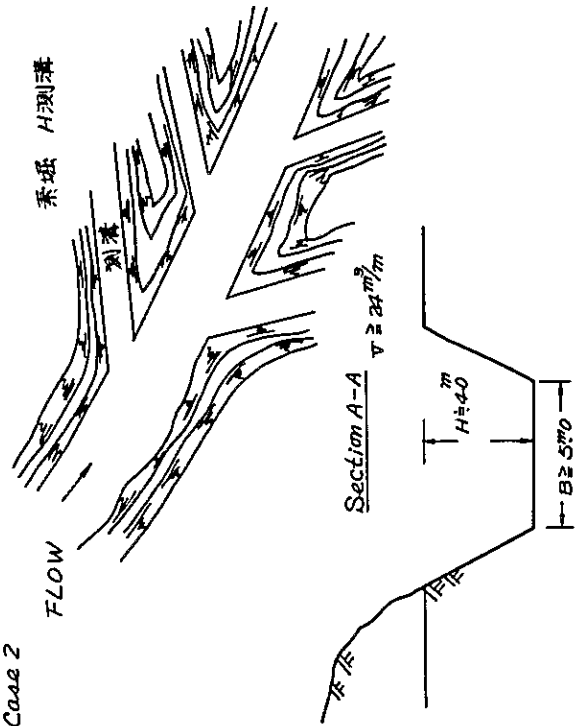
Case 4

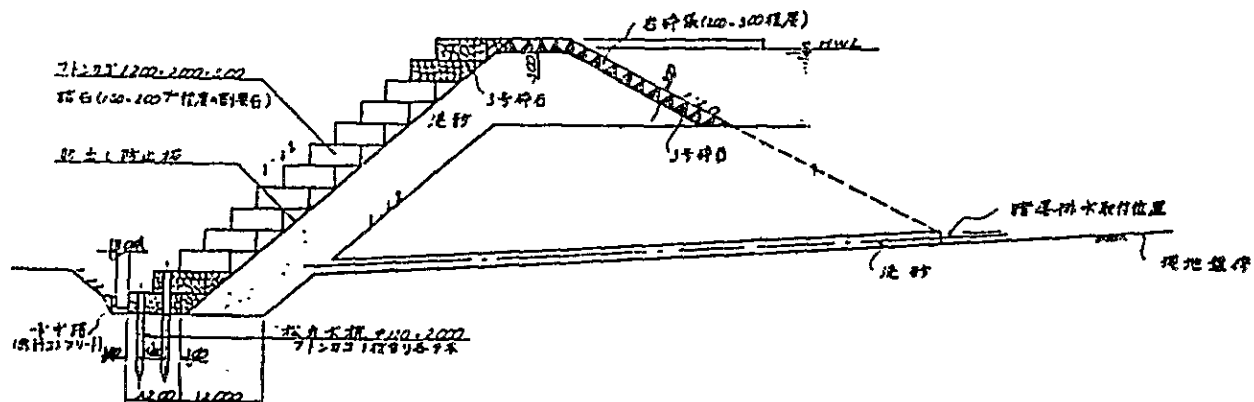


Case 1



Case 2





砂防ダム（フトンカゴ堰堤型式）構造図例

#### (6) 水源涵養林の事業化

この国における緑化対策としては現在のところは各家庭における緑化とハイウェー、公共施設等の緑化となっており、山岳部及び平野部における緑化については何等施策がなされていないと推測される。特に南部地方の山岳部は落葉灌木がかなり植生しており又一部には常緑樹も植生していることから、水源涵養の為の造林の可能性は充分であると推測される従って植林の為の苗圃、植林技術、組織体制の確立等が急務であると考ええる。

当面は南部の山岳地帯から植栽を始め、逐次北部地方についても（ワジなどに植生がある）植栽計画をおし進めて行く必要がある。







# 附 録

## 1. 調査団員名簿

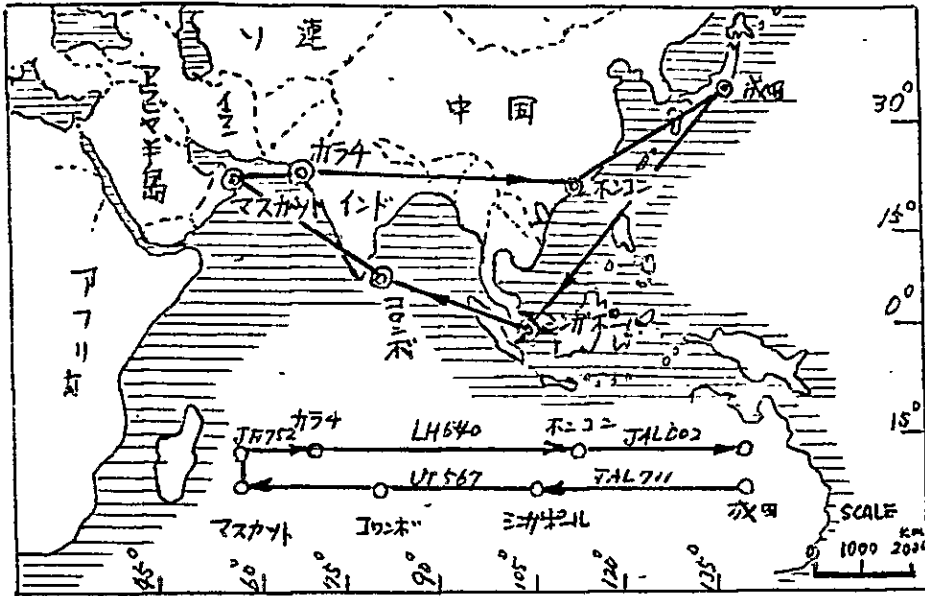
|         |           |                                    |
|---------|-----------|------------------------------------|
| 団 長（総括） | 那 須 理 三 郎 | 農林水産省，北陸農政局，建設部次長                  |
| かんがい    | 瀬 山 修 平   | 北海道開発庁，北海道開発局，函館建設部，厚沢部川農業，開発事務所副長 |
| 地 質     | 中 馬 教 允   | 農林水産省，東北農政局，計画部，資源課地質官             |
| 農 業     | 寺 沢 四 郎   | 農林水産省，農業技術研究所，化学部，土壤物理研究室長         |
| 協力企画    | 田 原 高 文   | 農林水産省，経済局，国際協力課，海外技術協力官            |
| 協力政策    | 鬼 頭 平 三   | 外務省，経済協力局，開発協力課                    |
| 業務調整    | 正 崎 雄 三   | 国際協力事業団，特別囑託                       |

## 2. 調査日程及び行程図

| 日順 | 月日（曜）   | 行 程                      | 調 査 内 容   |
|----|---------|--------------------------|---|
| 1  | 6/21(土) | 東京発                      |   |
| 2  | 22 (日)  | マスカット着                   | 農漁業省訪門及び打合せ                                     |
| 3  | 23 (月)  | マスカット<br>"<br>マスカット→ルメイス | 農漁業省広報課との打合せ<br>Planning Unit との打合せ<br>ルメイス農試視察 |
| 4  | 24 (火)  | マスカット                    | 水資源公社，農業局，水資源かんがい局との打合せ                         |
| 5  | 25 (水)  | マスカット                    | 農漁業省広報課との打合せ                                    |

| 日順 | 月日(曜)  | 行 程                | 調 査 内 容  |
|----|--------|--------------------|--|
| 6  | 26(木)  | マスカット              | 水資源公社, 農漁業省の図書館にて資料収集  |
| 7  | 27(金)  | マスカット              | 市内の調査  |
| 8  | 28(土)  | マスカット→ソハール         | Sohar 地区現地調査<br>ソハール農業局事務所訪門<br>Wadi Jizi, Oman Sun Farm 視察  |
| 9  | 29(日)  | マスカット→ルスタック        | Rustaq 地区現地調査<br>ルスタック普及事務所訪門<br>Wadi Bani Kharus, Date Factory の視察                                  |
| 10 | 30(月)  | マスカット              | 水資源公社, 水資源かんがい局との打合せ   |
| 11 | 7/1(火) | マスカット→ニズワ          | Nizwa 地区現地調査<br>Wadi Samail, Wadi Coriyat, Mesfa の視察<br>ニズワ農業局事務所訪門                                  |
| 12 | 2(水)   | マスカット→サルキア         | Syarkia 地区現地調査<br>Wadi Al Kamil 視察<br>Ibra 農業局事務所訪門  |
| 13 | 7/3(木) | マスカット              | 石油鉱物省訪門  |
| 14 | 4(金)   | マスカット→サララ          |  |
| 15 | 5(土)   | サララ                | 水資源かんがい局訪門<br>農業局訪門<br>Salalah 地区現地調査<br>Ayn. Garziz, Ayn. Sahal Nawi,<br>Ayn. Arzat, Wadi Darbat 視察 |
| 16 | 6(日)   | サララ                | Salalah 地区現地調査<br>Quiroon Heirithi Farm, Garziz Farm 視察  |
| 17 | 7(月)   | サララ→マスカット<br>マスカット | 開発審議会訪門<br>報告書作成 (農漁省主催レセプション)   |
| 18 | 8(火)   | マスカット              | 農漁業省訪門<br>中間報告書提出<br>外務省 Third Dept 訪門 (調査団主催レセプション)   |
| 19 | 9(水)   | マスカット→カラチ          | 議事録交換  |
| 20 | 10(木)  | カラチ→ホンコン           |  |
| 21 | 11(金)  | ホンコン→東京            |  |

行程図



### 3. 面会者名簿

#### MINISTRY OF AGRICULTURE & FISHERIES

|                                |                                      |
|--------------------------------|--------------------------------------|
| H.E. Hassan Muraza             | The Undersecretary                   |
| Dr. Khanfar                    | Act. Director General of Agriculture |
| Mr. Talib Harib                | Asst. D.G. of Irrigation & Water     |
| Dr. Alem                       | Head of Planning Unit                |
| Dr. Akalal                     | Water Expert                         |
| Mr. Khakid Al Zubaidy          | Director of Information Unit         |
| Mrs. Aliya Salim S. Al Busaidy | Director of Public Relation          |
| Mr. Mohamed Muktar             | Acting Director of Public Relation   |
| Miss Hind S.N. Al Abry         | Head of Public Relation              |

#### PLANNING UNIT

|                           |                          |
|---------------------------|--------------------------|
| Dr. Mohamed F. Snaraf     | F.A.O. Officer in Charge |
| Mr. M. Vazir Hassan       | Agriculture Expert       |
| Mr. Mohamed Tasnif        | Fisheries Expert         |
| Mr. Hassan Shehata Hassan | Economic Expert          |

#### MINISTRY OF AGRICULTURE & FISHERIES

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| Mr. Mohamed Abo Khantwa | Agric. Extension Expert            |
| Mr. Ahnaf O. Zubaidi    | Acting D.G. of Agriculture         |
| Mr. Abdul Salter Kota   | Agriculture Expert                 |
| Mr. Magid Bilarab       | Irrigation Section                 |

#### M.A.F. (SOHAR)

|                        |                                |
|------------------------|--------------------------------|
| Mr. Ali Sulayim Rashid | Director of Agriculture, Sohar |
|------------------------|--------------------------------|

#### M.A.F. (SHARQIA)

|                       |                                   |
|-----------------------|-----------------------------------|
| Mr. Ali Mohamed Salim | Director of Regional Sharqia Area |
|-----------------------|-----------------------------------|

#### M.A.F. (RUSTAQ)

|                         |                                      |
|-------------------------|--------------------------------------|
| Mr. Moud Abdulla Salleh | Agriculture Extension Center, Rustaq |
|-------------------------|--------------------------------------|

#### M.A.F. (NIZWA)

|                           |                                  |
|---------------------------|----------------------------------|
| Mr. Mohamed Ahmed Mahfodh | Director of Agriculture, Nizwa   |
| Mr. Suleiman Rashid       | Finance & Administration Section |

#### M.A.F. (SALALAH)

|                        |  |
|------------------------|--|
| Mr. Salem Alawi Babood | In Charge of Water Resources           |
| Mr. Salem Salam        | Hydrologist                            |
| Mr. Mohamed Zaazouh    | Water Engineer                         |
| Mr. Ali Tahar Moqabil  | Director of Agriculture, Salalah       |
| Mr. Ali Oman Mahfooz   | Assistant Director of Agriculture      |
| Mr. Mohamed Soukkary   | Assistant Adviser of Agriculture Dept. |

#### MINISTRY OF FOREIGN AFFAIRS

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| N.E. Kushtak Abdulla        | Director of Third Department |
| Mr. Salim Mohamed Al Riyami | Japan Bureau, Third Dept.    |

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Mr. Laan  
Mr. Abdul Kader O. Baabbad  
Dr. Steiner

Operation Manager, Salalah  
Farm Manager, Salalah  
Sohar  
Farm Manager, Sohar

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LIST OF ABBREVIATIONS

BC BRAIN COLQUHOUN  
 C CANSULT  
 CE CORPS OF ENGINEERS  
 CES CONSULTING ENGINEERING SERVICES  
 CIC COLORADO INTERNATIONAL CORPORATION  
 DC DEVELOPMENT COUNCIL (OMAN)  
 DAC DEVELOPMENT ASSISTANCE CORPORATION  
 DCL DEVELOPMENT CONSULTANTS LTD  
 DU DURHAM UNIVERSITY  
 FAO FOOD AND AGRICULTURAL ORGANIZATION  
 G GLENNIE  
 GO GEOLOGY OF OMAN (MISC. PAPERS)  
 GME GEOLOGY OF THE MIDDLE EAST (MISC. PAPERS)  
 GPP GIBB PETER MULLER AND PARTNERS  
 HC HYDROCONSULT  
 HTS HUNTING TECHNICAL SERVICES  
 HWP HAROLD WHITEHEAD AND PARTNERS  
 I ILACO  
 IRI INTERNATIONAL RESEARCH INSTITUTE  
 JI JORDAN INTERNATIONAL  
 JTS JOHN TAYLOR AND SONS  
 K KONTEATIS  
 LD LEWELLYER DAVIS  
 MC MINISTRY OF COMMUNICATIONS (OMAN)  
 MH MINISTRY OF HEALTH (OMAN)  
 MP MANDERSTAM AND PARTNERS  
 MAF MINISTRY OF AGRICULTURE AND FISHERIES (OMAN)  
 MAF(UAE) MINISTRY OF AGRICULTURE AND FISHERIES (U.A.E.)  
 MDC MUSANDAM DEVELOPMENT COMMITTEE  
 MEW MINISTRY OF ELECTRICITY AND WATER (OMAN)  
 MLM MINISTRY OF LAND AND MUNICIPALITIES (OMAN)  
 MPM MINISTRY OF PETROLEUM AND MINERALS (OMAN)  
 OMC OMAN MINING COMPANY  
 P PENCOL  
 PAWR PUBLIC AUTHORITY FOR WATER RESOURCES  
 PBI PARSONS BRINCKERHOFF INTERNATIONAL INC.  
 RSI RENARDET SAUTI ICE  
 SI SAUTI ICE  
 SAG SIR ALEXANDER GIBB AND PARTNERS  
 SMP SIR MACDONALD AND PARTNERS  
 SWA SIMPSON WEATHER ASSOCIATES  
 SWK SCOTT WILSON KILPATRICK

|      |  |
|------|--|
| SMAW | SAUDI MINISTRY OF AGRICULTURE AND WATER  |
| SMPM | SAUDI MINISTRY OF PETROLEUM AND MINERALS |
| TTI  | TETRA TECH INTERNATIONAL INC.            |
| TWP  | TURNER WRIGHT AND PARTNERS               |
| TWT  | TAYLOR WOODROW TOWELL                    |
| USBR | UNITED STATES BUREAU OF RECLAMATION      |
| USGS | UNITED STATES GEOLOGICAL SURVEY          |
| V    | VALTOS                                   |
| VC   | VADIS COMPANY S.A.                       |
| WB   | WORLD BANK                               |
| WHO  | WORLD HEALTH ORGANIZATION                |
| WHP  | WILLIAM HALCROW AND PARTNERS             |
| WRC  | WATER RESOURCES COUNCIL                  |
| WRD  | WATER RESOURCES DEPARTMENT               |

NOTE: - BOOKS BY THE FOLLOWING AUTHORS ARE NOT PRESENTLY AVAILABLE IN THE POWER LIBRARY, AS OF 27 MAY 1980:

- 1) CANSULT (C)
- 2) U.S. BUREAU OF RECLAMATION (USBR)
- 3) MINISTRY OF ELECTRICITY, & WATER (MEW)
- 4) OMAN MINING COY (OMC)
- 5) MUSANDAM DEV. COMMITTEE (MDC)
- 6) MINISTRY OF LAND & MUNICIPALITIES (MLM)

## 5. Summary of Discussion

1. The Government of Japan sent a preliminary survey team for an agricultural development project in the Sultanate of Oman. During the visit of the team in Oman from 22nd June to 9th July, 1980, the team held the discussion with the officials of the Ministry of Agriculture and Fisheries and carried out field surveys in Batinah, Oman Interior, Sharquiya and Southern Region: Wadi Jizi, Wadi Far, Wadi Bani Kharus, Nizwa, Al Kamil and Salalah.

2. Based on the results of the field surveys the team selected three areas which have high potentialities of agriculture development and put the following order of the priorities on each area for the feasibility study.

The order of the priorities:

1. Sohar - Wadi El Jizi.
2. Salalah Plain
3. Rustaq - Wadi Far, Wadi Bani Kharus.

3. The team submitted an interim report to the Ministry of Agriculture and Fisheries in which conceptions of the developments and priorities were described for each area.

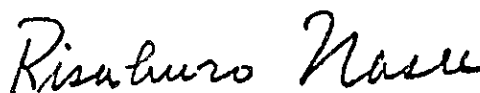
4. The Ministry of Agriculture and Fisheries agreed in principle on the conceptions of the developments and the order of the priorities.

5. The Government of the Sultanate of Oman requested the Government of Japan to send a follow-up mission for consultations with the Government of Oman on the scope of works for the feasibility study in the area of Wadi El Jizi (Sohar).

6. The Ministry of Agriculture & Forest equally requested the Government of Japan to help for full study of Agriculture Development in the Southern Region "Salalah".



H.A. Al-Morazza  
Undersecretary  
Ministry of Agriculture & Fisheries  
Sultanate of Oman



RISABURO HASU  
Team Leader  
Japanese Preliminary Survey Team  
for Agricultural Development Project

Date: 9th July, 1980.

PLACE: Muscat.

6. Interim Report

July 8, 1980

H.E. Hassan Murraza,  
The Undersecretary,  
Ministry of Agriculture & Fisheries,  
MUSCAT.  
SULTANATE OF OMAN.

Your Excellency,

Submission of Interim Report  
on Preliminary Survey of  
Agricultural Development  
Project.

I have a great pleasure to submit herewith an Interim Report on Preliminary Survey of Agricultural Development Project, carried out by the Survey Team dispatched by the Government of Japan.

The Team carried out the survey thoroughly and sufficiently and had a series of discussions every now and then with officials concerned.

The contents of the report are, however, tentative and subject to revision on the occasion of making the final report after our return to Japan.

I expect that the Government of Japan will make necessary actions and procedures for the next step of the project as soon as possible.

In this occasion, I would like to express to you my hearty thanks for sincere cooperation, convenience and hospitality extended to us by you and your staff during our stay in Oman.

I remain,

Respectfully yours,

RISABURO NASU  
Team Leader  
Japanese Preliminary Survey Team  
for Agricultural Development Project.

THE SULTANATE OF OMAN  
MINISTRY OF AGRICULTURE AND FISHERIES

INTERIM REPORT  
ON  
PRELIMINARY SURVEY OF AGRICULTURAL DEVELOPMENT

JULY 1980

JAPAN INTERNATIONAL COOPERATION AGENCY

## TABLE OF CONTENTS

### INTRODUCTION

- I. General Remarks on the Agriculture of the Sultanate of Oman.
  
- II. Areas Studied
  1. Sohar (The Wadi Jizi)
  2. Rustaq (The Wadi Far, Bani Kharus, Ma-awil)
  3. Salalah Plain
  4. Comments on other areas
  
- III. Concluding Remarks  
  
Annexe List of Members

### INTRODUCTION

In response to the request of the Government of Oman, the Government of Japan dispatched the Preliminary survey team for Agricultural Development Project in Sultanate of Oman (hereafter mentioned as the team) through Japan International Cooperation Agency. The team headed by Mr. Risaburo Nasu stayed in the Sultanate of Oman from June, 22nd to July, 9th, 1980. (List of members is shown in Annexe)

The terms of reference of the team are to select and delineate the project area, to study technical skill of the survey and to collect the relevant existing data and information.

During the stay of nineteen days in the Sultanate, the team made a quick review of existing reports and studies on water resources and agricultural development. Discussions were held with the Government officials concerned on these subjects. The team made field surveys arranged by the Ministry of Agriculture and Fisheries in four main agricultural areas - Batina Coast, Interior Sharfiya and Salalah area - and collected information at farmers level.

Due to the positive cooperation extended by the Government of Oman, the survey was carried out satisfactory obtaining the following findings and conclusions.

### GENERAL REMARKS ON THE AGRICULTURE OF THE SULTANATE OF OMAN

The Sultanate of Oman is the greenest country of Arabia and the majority of the population is engaged in agriculture, the Sultanate, moreover, has a strong potentiality for agricultural developments. Prospective areas for development are identified on both sides of the mountains in the Northern Oman and on the Salalah Plain. The estimated acreage of lands in those areas is believed to around 20,000 acres provided that the water is available for irrigation.

In the second five-year plan (1981-1985) currently under preparation, the agricultural sector is said to continue to be one of the highest priority sectors. The agricultural sector, which has attained higher growth rates than anticipated, still has much to go in order to meet the local demands for food because the diversification in demands is due to continue as a result of the improvements in the quality of life and the rapid progress of the urbanization. The desire to export surpluses of the food is urgent in order to diversify the economy. The agriculture, therefore, is considered to be one of the most strategic industries of the Sultanate of Oman.

Dates and limes are traditional Omani Crops for export, and still are the most important crops. Research into the production of fruits and vegetables is extensively carried out in every agricultural region of the country and the value added on those crops has shown remarkable increases. A large amount of vegetables, however, is imported in summer because the production of vegetables is limited to the winter time in the Northern Oman. The Salalah Plain could be a great source of vegetable supply to the Capital area if the net work of roads is completed because the Salalah Plain is suitable for vegetable, production even in summer due to the monsoon rains from June to September.

Erratic occurrences of intense storms with sporadic distribution, combined with impermeable steep terrains of the mountains, largely determine unique hydrological characteristics of the Sultanate of Oman. Most of the rain water runs, in only a matter of hours, to waste into the sea along the coastal side of the mountains and into desert sands on the other. Floods and unsteady "Wadi" (dry river channel) beds, not to speak of an unreliable nature of surface flow, are few of the problems associated with the runoff characteristics.

Because of those characteristics of surface flows, the people in the Sultanate used to rely exclusively on ground water. It should be noted that the ancient irrigation system called "Falaj", rooted in the unknown past, has been handed down from generation to generation. A Falaj is a system for the distribution of water and it means a hand-dug tunnel, in some cases, extending as far as 20 K.M. The water tapped in the gravels of a Wadi is brought to the surface through Falaj tunnels by the gravity.

With the introduction of diesel pumps, beginning in 1950, abstractions of ground water from shallow wells, largely dug in aluvial deposits, provided ubiquitous opportunities for inexpensive developments of farm lands. Overpumping, however, has caused deterioration of the water quality, mostly a salinity problem, in some places along the coastal plains. As for the interior regions, ever-increasing abstractions from the wells might induce subsidences of water tables and eventually might arouse controversies over the water among the Falaj users and the well pumpers. Water has been, and would continue to be the basic constraint on agricultural developments in the Sultanate of Oman.

#### 1. Sohar (The Wadi Zizi)

A short reconnaissance survey was made on the Wadi Zizi about 30 K.M. south-west of Sohar.

The Wadi meanders through a U-shaped valley (approximate width and depth: 150 M 10 M), but it still seems to have the gradient of 1:200 on average. The Wadi bed is composed of aggregates with boulders (diameters: 20 30 C.M.) scattered.



There is a pool (approximate width and depth: 30 x 10 M 30 50 C.M.) with some fish in it. A stream runs from the pool but infiltrates back into the Wadi bed about 200 M downstream of the pool.

The bed rock under the Wadi bed is supposed to be a member of Ophiolites and it could be less permeable.

#### Conceptualization of Agricultural Development

Water tapped in upstream Wadi beds should be conveyed to the land lying along the coastal road.

Series of diversion dams with adequate intervals should be built in a Wadi valley perpendicular to the stream line. The dams should serve to stabilize the Wadi bed as well as to raise the water levels. The water should be collected through tunnels/shafts especially designed for tapping the water in the gravels of the Wadi. The abstracted water should be converged into a conveyer conduit.

System for conveyance of the water should be an open or semi-open type which necessitates pressure release stands.

In the latter stages of the developments, the supply of water should be increased by detention dams and/or ground water re-charging facilities.

#### 2. Rustaq (The Wadies Far, Bani Kharus, Ma awil)

A one-day reconnaissance survey was made across the three wadies.

Mountains with steep slopes are just beyond the both sides of the Wadi beds. Rocks are of ophiolite and of ultra basic with clear evidence of major and minor faults.

The width of wadi beds is more than 200 M on average. The composition of the wadi beds is almost the same as the Wadi Zizi, i.e. aggregates, although the depth of aggregates is observed to be deeper.

There are several oasis villages, along the cruised course, the Falaj serving each one of the villages has its origin in the gravels of a wadi - a measured depth to a horizontal tunnel is 6 times as deep as an average height of man.

#### Conceptualization of Agricultural Development

Water withdrawn is to be used in the existing villages while the balance could be utilized for new lands.

Topography and Geology of the area should allow the construction of underground reservoirs. Series of low dams floating on the gravels with an extensive grout curtain under each one of them should also stabilize wadi beds.

Methods of tapping the water and of conveying the water are essentially the same as the wadi zizi, although cares should be taken for the local farmers.

Surface detention of the water or recharge to the ground water should also be considered in the latter stages of the resources developments.

### 3. Salalah Plain

A three-day field trip to the Salalah Plain was arranged through the courtesy of the Ministry of Agriculture and Fisheries.

The monsoon and the limestones give the area a natural environment clearly different from that of the Northern Oman. The aquifers in the Plain currently in use are in the limestones as well as in the aluvial deposits and relatively shallow (upto 60 M). The water from the aquifers is replied to be of good quality and sufficient in quantity with little seasonal fluctuations in the water levels.

Two development schemes utilizing the spring water are completed, and the results are very instructive from a hydrogeological point of view. A complementary scheme of ground water development is now ready for implementation. Another large scale development is going to take off whenever the coordination of the pumping wells is finished.

### Conceptualization of Agricultural Development

Water may or may not be available for further developments if the projected schemes are completed to the full extent. It should be necessary to identify the current state of development and to assess the potential for the developments in the future. A master plan for the Plain should be prepared on the stronger data base and should be approved by those who are concerned in order to control the unexpected deterioration of the water.

A mathematical model of the Plain with an emphasis on the ground water should be constructed and be simulated on the alternatives for the future. Accuracy of the information on the geological structure of the plain is crucial although land classification based on a soil survey can not be missed.

### 4. Comments on other areas

#### Al Kamil

A long one-day trip to the pumping cite of the Ministry of Agriculture and Fisheries was made from Muscat.

The projected area is extensive and the soils of the area are good. The Wadies flowing into the area have large watershed areas compared to the wadies on the coastal plains.

A master plan for the development should be formulated based on a solid estimation of an over-all hydrological cycle, because there are a fairly large number of Falajes and wells in the watersheds. Any idea about tapping and conveying the water from the wadi bani Khalit should be scrutinized while recharging schemes are to be studied on the latter phase of the developments.

## Misfah

The village is located in a deep detached valley gouged in ultra basic rocks about 1500 M above the sea level. The cultivated lands of the village are on different levels of terraces on the walls of the valley. The water flowing from the higher location of the valley is channeled down to the cultivated lands.

It should be possible to enhance the quality of life in the village by taking the following measures:

1. Building a pipeline system for drinking water,
2. Equipping a small size hydro generator in order to take advantage of the gravity head of the water,
3. Constructing a rope way system with auxiliary roads extending from terminals of the rope way.

## III. Concluding Remarks

The proposed concept for the Rustaq area needs coordination with the on-going project and with the local users of the existing Falajes. The studies on the Rustaq area, thus, should be placed in the lowest echelon.

The intensity of the developments on the Salalah Plain may abruptly cause water problems in the foreseeable future. Estimated costs for the areal studies, however, may be far beyond the reach of the Japanese Government if the requirements for the studies are extensive as well as intensive. The studies on the Plain, therefore, should not be given a first priority, although the urgency of the studies should not never be under-estimated.

The concept for Sohar is essentially in the nature of a pilot project and it should be applied to similar areas if the results of the project would be acceptable. Further more, the area is now experiencing a large scale agricultural development project, of which effects should be assessed anyhow. A top priority, accordingly, is to be given to the area of Sohar.

ANNEXE LIST OF MEMBERS

| Assignment                | Name                 | Position  |
|---------------------------|----------------------|---|
| Leader                    | Mr. Risaburo NASU    | Vice-Director,<br>Construction Dept.,<br>Hokuriku Regional<br>Agricultural Administration Office,<br>Ministry of Agriculture,<br>Forestry and Fisheries.          |
| Agriculture               | Mr. Shiro TERASAWA   | Chief,<br>Soil Physics Laboratory,<br>National Institute of<br>Agricultural Science,<br>Ministry of Agriculture,<br>Forestry and Fisheries.                       |
| Irrigation                | Mr. Shuhei SEYAMA    | Deputy Director,<br>Assabe Agricultural<br>Development Office,<br>Hakodate Construction Dept.,<br>Hokkaido Development Agency.                                    |
| Geology                   | Mr. Norichika CHUMAN | Geologist,<br>Resources Div.,<br>Planning Dept.,<br>Tohoku Regional Agricultural<br>Administration Office,<br>Ministry of Agriculture,<br>Forestry and Fisheries. |
| Cooperation<br>& Planning | Mr. Takafumi TAHARA  | Senior Official,<br>International Cooperation Div.,<br>Economic Affairs Bureau,<br>Ministry of Agriculture,<br>Forestry and Fisheries.                            |
| Cooperation<br>& Policy   | Mr. Heizo KITO       | Senior Official,<br>Development Cooperation Div.,<br>Economic Cooperation Bureau,<br>Ministry of Foreign Affairs.   |
| Coordination              | Mr. Yuzo SHOZAKI     | Technical Adviser,<br>Japan International<br>Cooperation Agency.  |

7. Scope of Works (案)

調査実施に先だつての要検討事項

| 調 査 項 目  |  |
|--|--|
| <p>目的<br/>受入機関 農漁業省水資源灌漑局</p> <p>I. 既存の調査・研究結果及び観測結果の収集とレビュー</p> <p>II. 現地調査</p> <p>II-1 自然条件</p> <p>a. 気象観測</p> <p>b. 地質調査</p> <p>c. 水文調査</p> <p>d. 土壌調査</p> <p>e. 植生調査</p> <p>f. 地下水調査</p> <p>II-2 農業生産活動</p> <p>a. 現況土地利用</p> <p>b. 作物生産</p> <p>c. かんがい現況</p> <p>d. 農家経営調査</p> <p>e. 生産物・投入材等流通市場調査</p> <p>f. その他</p> <p>III. 地形図の作成</p> <p>III-1 航空写真の撮影 ( )</p> <p>III-2 1/50,000 地形図の図化<br/>面積<br/>等高線</p> <p>III-3 1/5,000 地形図の図化<br/>位置<br/>等高線</p> <p>IV. 収集資料, データーの分析</p> <p>V. 水資源, 農業開発計画の作成</p> <p>VI. 建設費積算及び経済効果分析</p> <p>VII. レポート及び地図の提出</p> <p>VII-1 インセプションレポート</p> <p>VII-2 インテリム (プログレス) レポート</p> <p>VII-3 ドラフト・ファイナルレポート</p> <p>VII-4 ファイナルレポート</p> <p>VII-5 地形図原図の提出</p> | <p>研修員受入れに関するオ側意向。<br/>農業省, Water Resource Authority との関係。<br/>事前調査団の参考資料リスト, 収集観測データー等を参考にする。</p> <p style="text-align: right;">実務レベル 2人<br/>高級官僚 2人<br/>12月に3週間</p> <p>{ その実施主体。(日本側か, オマーン側か)<br/>雨量, 流量観測の必要性。季節変化観測の必要性。<br/>調査範囲及び取りまとめ方法。</p> <p>調査範囲及び取りまとめ方式。<br/>必要性(?)</p> <p>オ側の農場形態に対する意向により不用か。</p> <p>・既存写真の有無(ex. 海岸部の写真の使用可能性)。<br/>{ ・写真撮影の許可<br/>特に我国航測会社の使用に当って。<br/>・写真の国外持ち出しの許可</p> <p>問題点: パイプライン沿線の測量・図化をどうするか。</p> <p>どのような農業経営形態, 作物を考えているのか。</p> |

| 調 査 項 目   |  |
|---|--|
| <p>VII. 日 程</p> <p>K. 両国の責任分担</p> <p>K-1 オ側の責任分担</p> <p>(1) 事務所の提供</p> <p>(2) カウンターパート</p> <p>(3) 航空写真撮影及び写真の国外持出し手続を完了させる。</p> <p>(4) 資料, データーのえつ覧・複写の許可。(特にWater Resource Authority)</p> <p>(5) 収集資料の国外持ち出し。</p> <p>(6) 現地調査用の地図(1/100,000)の提供。</p> | <p>S/W協議</p> <p>F/S (乾期及び雨期)</p> <p>航空撮影</p><br><p>問題点: 場所, マスカット or ソハール</p> <p>駐在場所 分野</p> |

|                                  |    |
|----------------------------------|----|
| 8. 基礎データ                         |    |
| (1) 地理的特色                        | 85 |
| (2) 降雨状況                         | 86 |
| (3) 降雨の統計                        | 87 |
| (4) 降雨量の変動（マスカット地区）              | 88 |
| (5) 月別気温，湿度及び蒸発量                 | 89 |
| (6) 経済活動別会社の登録数                  | 90 |
| (7) 原油生産量                        | 91 |
| (8) 輸出及び輸入                       | 92 |
| (9) 輸入品目別柱状図                     | 93 |
| (10) 政府の歳出，歳入                    | 94 |
| (11) 政府の医療と公共保健機関及び病室数           | 95 |
| (12) 政府の学校，生徒及び先生                | 96 |
| (13) 農地面積及び作付面積                  | 97 |
| (14) 国営農場，農業試験所，普及農場，普及センター及び育苗棟 | 97 |
| (15) 地域別作物及び作付面積                 | 98 |
| (16) オマーン国における各種資材価格             | 99 |

(1) 地理的特色

① 地理的特色

The Sultanate of Oman occupies most of the south-eastern corner of the Arabian Peninsula and has a coast line stretching almost 1700 km. from the Straits of Hormuz in the north to the frontier with the People's Democratic Republic of Yemen. The Musandam Peninsula, the northern-most point of Oman, is separated from the main body of the Sultanate by a strip of territory which is part of the United Arab Emirates (UAE).

Oman is located between latitudes 16°40'N and 26°20'N and longitudes 51°50'E and 59°40'E.

| Land area                       | Sq. km.        | Sq. miles      |
|---------------------------------|----------------|----------------|
| <b>Total</b>                    | <b>300,000</b> | <b>120,000</b> |
| of which, regions :             |                |                |
| Dhofar                          | 100,000        | 40,000         |
| Musandam                        | 2,000          | 800            |
| Other                           | 198,000        | 79,200         |
| and, type of terrain :          |                |                |
| Mountains (450m + )             | 45,000         | 18,000         |
| Coastal plains, inhabited       | 9,000          | 3,600          |
| Wadi and desert areas (450m - ) | 246,000        | 98,400         |

② 人口

\* No population census has so far been carried out in Oman and precise population figures are not available. For planning purposes the population is assumed to be 1,500,000\* (for 1974).



## (2) 降雨状況

## 各地域別年降雨量

|                |      | 単位 mm |      |                  |      |      |                       |  |
|----------------|------|-------|------|------------------|------|------|-----------------------|--|
|                | 標高 m | 標高 m  | 1975 | 1976             | 1977 | 1978 | 5年平均                  |  |
| Sohar          | 15   | 78    | 53   | 252              | 160  | 47   | 118                   |  |
| Wadi Jizzi     | 500  | 51    | 81   | 375              | 107  | 91   | 141                   |  |
| Rostaq         | 350  | (142) | 166  | 277              | 249  | 92   | 185                   |  |
| Nizwa          | 350  | (39)  | 215  | 180              | 190  | 149  | 155                   |  |
| Al Wafi        |      | (42)  | 52   | 150              | 110  | 150  | 101                   |  |
| Muscat         | 5    | (25)  | 80   | 203              | 181  | 74   | 113                   |  |
| Salalah        |      | 21    | 42   | 74               | 394  | —    | (4年) 133              |  |
| Medinat Al Haq |      | 123   | 223  | 286 <sup>⊕</sup> | —    | —    | (3年) 211 <sup>⊕</sup> |  |

## 各地域別月降雨量 (1977 &amp; 1978)

|                |      | 単位 mm |      |       |       |       |       |      |      |      |     |     |       |
|----------------|------|-------|------|-------|-------|-------|-------|------|------|------|-----|-----|-------|
|                | 1    | 2     | 3    | 4     | 5     | 6     | 7     | 8    | 9    | 10   | 11  | 12  | 計     |
| Sohar          | —    | 34.2  | 6.5  | 2.0   | —     | —     | 3.6   | —    | —    | —    | —   | 0.3 | 46.6  |
| Wadi Jizzi     | —    | 31.2  | 4.3  | 0.5   | —     | 2.0   | 22.5  | 30.5 | —    | —    | —   | —   | 91.0  |
| Rostaq         | 9.5  | 19.5  | 19.5 | 4.8   | —     | —     | 13.0  | 19.7 | 13.8 | —    | —   | —   | 91.8  |
| Nizwa          | 31.8 | 3.3   | 42.5 | 3.4   | —     | 0.2   | 54.4  | 13.0 | —    | —    | —   | —   | 148.6 |
| Al Wafi        | 10.5 | 28.5  | 2.5  | 22.0  | —     | 16.5  | 64.5  | —    | —    | —    | 5.5 | —   | 150.0 |
| Muscat         | 29.5 | 24.5  | 17.2 | 1.5   | —     | —     | 1.0   | —    | —    | —    | —   | —   | 73.7  |
| Salalah        | 0.7  | —     | —    | 122.5 | 59.8  | 124.0 | 28.7  | 23.9 | 0.9  | 33.7 | —   | —   | 394.2 |
| Medinat Al Haq | —    | —     | —    | 74.1  | 206.0 | 482.3 | 152.8 | x    | x    | 9.6  | —   | —   | 1,100 |

(注) Salalah &amp; Medinat Al Haq : 1977のデーター

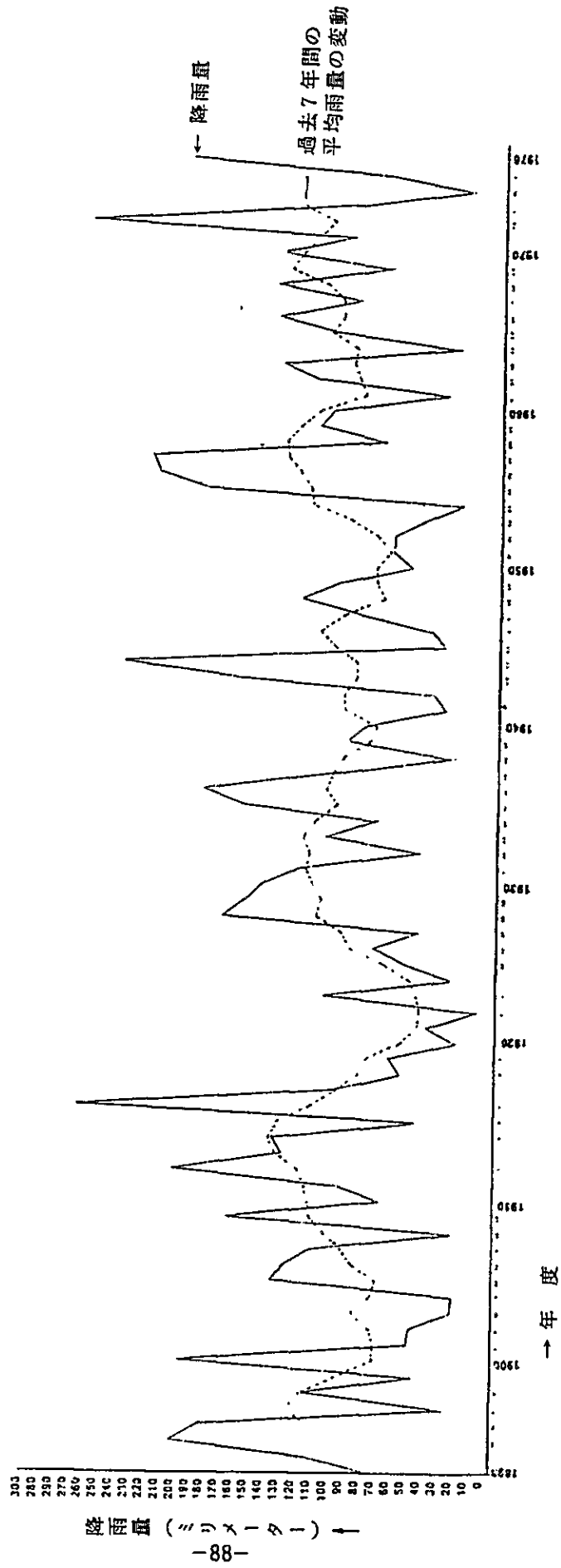
(3) 降雨の統計

単位 m/m

| Month     | Muscat           |         |         |         |                 |       |      |      | Rostaq  |         |         | Nizwa   |         | Al Wafi |         | Satalah |         |         |
|-----------|------------------|---------|---------|---------|-----------------|-------|------|------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
|           | Monthly averages |         |         |         | Monthly actuals |       |      |      | Actuals | Actuals | Actuals | Actuals | Actuals | Actuals | Actuals | Actuals | Actuals | Actuals |
|           | 1893-1920        | 1921-50 | 1951-76 | 1893-76 | 1976            | 1977  | 1978 | 1978 | 1978    | 1978    | 1978    | 1978    | 1978    | 1978    | 1975    | 1976    | 1977    | 1977    |
| January   | 28.3             | 25.2    | 33.7    | 29.0    | 44.5            | 54.0  | 29.5 | 9.5  | 28.9    | 10.5    | 1.0     | —       | —       | —       | —       | —       | —       | —       |
| February  | 21.3             | 14.5    | 19.1    | 18.7    | 59.5            | 23.7  | 24.5 | 11.5 | 3.3     | 28.5    | 1.0     | —       | —       | —       | 1.8     | —       | —       | —       |
| March     | 15.5             | 5.1     | 11.7    | 11.2    | 53.0            | 6.8   | 17.2 | 19.5 | 42.5    | 2.5     | 6.4     | —       | —       | —       | —       | —       | —       | —       |
| April     | 10.5             | 3.7     | 10.4    | 8.5     | 35.3            | 16.5  | 1.5  | 3.8  | 2.3     | 22.0    | 4.6     | —       | —       | —       | 75.2    | —       | —       | 83.2    |
| May       | 0.1              | 0.1     | 6.7     | 2.3     | —               | Tr.   | —    | —    | —       | —       | 13.7    | —       | —       | —       | —       | —       | —       | 40.3    |
| June      | 2.9              | Tr.     | 1.7     | 1.7     | —               | 8.1   | —    | —    | 1.0     | —       | 4.0     | —       | —       | —       | —       | —       | —       | 159.0   |
| July      | 0.4              | 0.2     | 4.1     | 1.6     | 8.0             | Tr.   | 1.0  | 8.0  | 51.1    | —       | 27.0    | —       | —       | 28.0    | 27.5    | —       | —       | 25.1    |
| August    | 0.9              | Tr.     | 4.6     | 1.9     | —               | 0.5   | —    | 24.0 | 10.1    | —       | 26.7    | —       | —       | 21.0    | 10.2    | —       | —       | 23.3    |
| September | —                | —       | —       | —       | —               | —     | —    | 12.0 | Tr.     | —       | 3.4     | —       | —       | 22.0    | 2.2     | —       | —       | 2.8     |
| October   | 2.3              | 2.8     | Tr.     | 1.7     | —               | —     | —    | —    | —       | —       | 7.6     | —       | —       | —       | —       | —       | —       | 30.5    |
| November  | 8.3              | 7.7     | 6.8     | 7.6     | —               | 74.7  | Tr.  | —    | —       | 5.5     | 8.7     | —       | —       | —       | —       | —       | —       | —       |
| December  | 15.0             | 28.5    | 17.4    | 19.5    | 3.0             | Tr.   | —    | —    | —       | —       | 3.8     | —       | —       | —       | —       | —       | —       | 3.5     |
| Total     | 105.5            | 87.8    | 116.2   | 103.7   | 203.3           | 181.3 | 73.7 | 88.3 | 139.2   | 69.0    | 107.9   | 71.0    | 116.9   | 367.7   | —       | —       | —       | —       |

Tr = Trace rainfall.

(4) 降雨量変動 (マスカット地区)



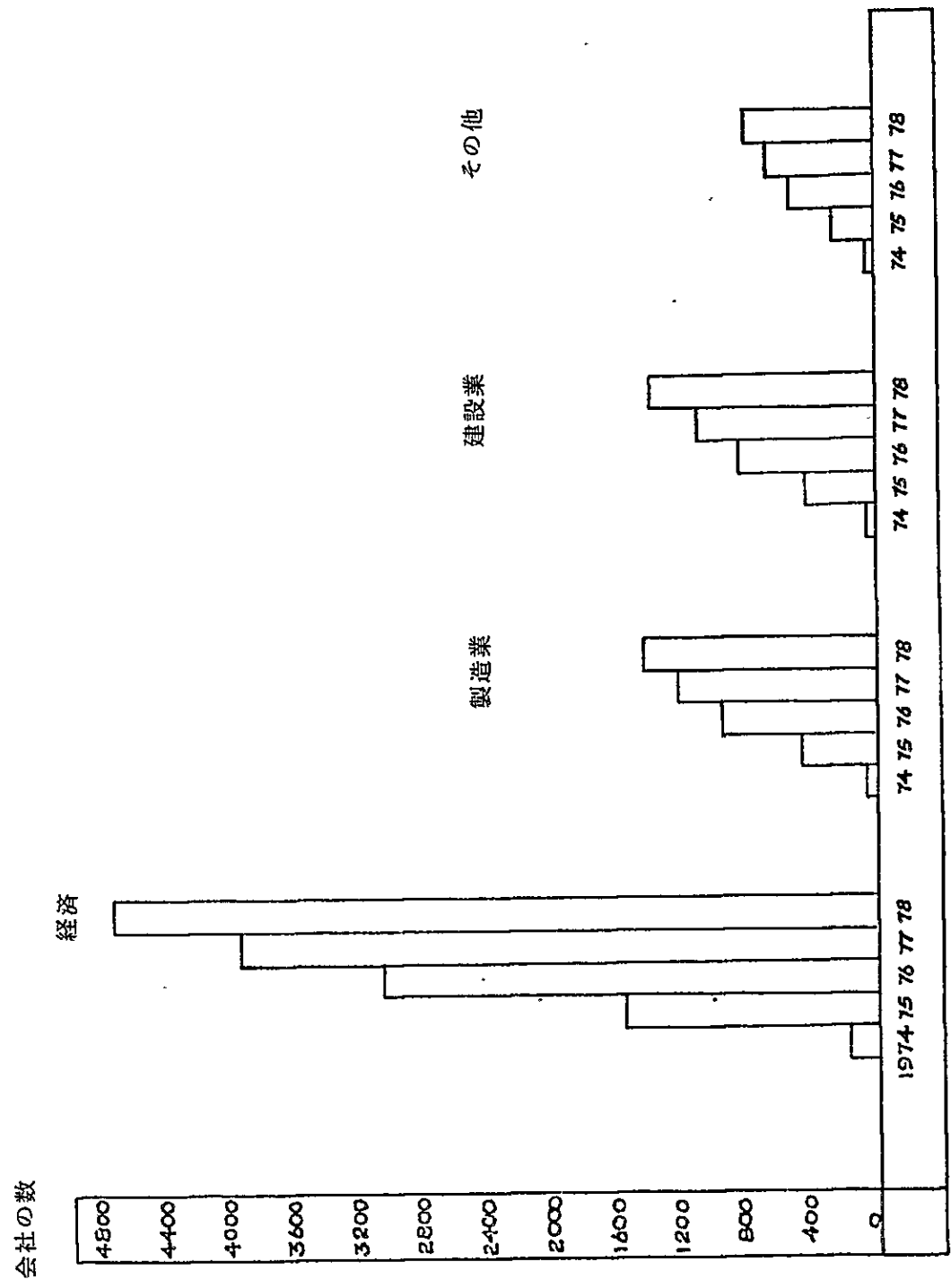
(5) 月別気温, 湿度, 及び蒸発量

| 地域      | 項目    | 1    | 2    | 3    | 4    | 5    | 6    | 7    | 8    | 9    | 10   | 11   | 12   | 平均    |
|---------|-------|------|------|------|------|------|------|------|------|------|------|------|------|-------|
| Sohar   | M max | 23.8 | 23.9 | 28.5 | 31.3 | 38.3 | 39.1 | 37.3 | 36.6 | 36.1 | 33.7 | 28.9 | 26.0 | 32.0  |
|         | M min | 12.0 | 12.8 | 15.8 | 17.8 | 23.3 | 25.5 | 27.3 | 27.1 | 23.9 | 18.8 | 14.0 | 12.7 | 19.2  |
|         | R/H   |      |      |      |      |      |      |      |      |      |      |      |      |       |
|         | Er    | 80   | 91   | 139  | 172  | 222  | 239  | 241  | 216  | 192  | 145  | 102  | 82   | 1,919 |
| Rostaq  | M max | 24.7 | 25.8 | 30.7 | 34.5 | 41.3 | 43.0 | 41.5 | 40.7 | 39.1 | 35.1 | 30.4 | 26.9 | 34.5  |
|         | M min | 11.0 | 12.1 | 15.1 | 17.5 | 22.3 | 25.1 | 27.6 | 24.9 | 23.7 | 20.0 | 15.3 | 14.0 | 19.1  |
|         | R/H   | 65   | 72   | 64   | 53   | 50   | 52   | 75   | 52   | 55   | 55   | 53   | 65   | 59    |
|         | Er    | 90   | 108  | 185  | 210  | 265  | 270  | 236  | 222  | 203  | 172  | 122  | 91   | 2,174 |
| Al Wati | M max | 28   | 29   | 34   | 38   | 42   | 42   | 43   | 40   | 39   | 37   | 33   | 29   | 36.2  |
|         | M min | 14   | 15   | 17   | 23   | 25   | 27   | 27   | 24   | 23   | 21   | 17   | 16   | 20.8  |
|         | R/H   | 70   | 66   | 57   | 57   | 60   | 62   | 64   | 72   | 69   | 58   | 64   | 72   | 64    |
|         | Er    | 132  | 178  | 270  | 247  | 350  | 369  | 403  | 334  | 256  | 289  | 252  | 190  | 3,270 |
| Muscat  | M max | 25.0 | 25.0 | 28.3 | 32.2 | 36.7 | 37.8 | 36.1 | 33.3 | 33.9 | 33.9 | 30.0 | 26.1 | 31.5  |
|         | M min | 18.9 | 19.4 | 22.2 | 25.6 | 30.0 | 31.1 | 30.6 | 28.9 | 28.3 | 26.7 | 22.8 | 20.0 | 25.4  |
|         | R/H   | 72   | 73   | 71   | 64   | 58   | 72   | 77   | 82   | 75   | 69   | 69   | 70   | 71    |
|         | Er    |      |      |      |      |      |      |      |      |      |      |      |      |       |
| Salalah | M max | 26.8 | 29.5 | 29.4 | 31.5 | 31.8 | 31.4 | 28.9 | 28.1 | 28.5 | 30.7 | 30.3 | 28.2 | 29.6  |
|         | M min | 15.7 | 18.1 | 18.9 | 23.1 | 24.5 | 25.6 | 24.6 | 23.5 | 22.8 | 20.4 | 17.8 | 16.7 | 21.0  |
|         | R/H   | 59   | 59.5 | 66.2 | 70.0 | 82.0 | 83.9 | 85.2 | 87.7 | 82.0 | 69.8 | 57.5 | 62.2 | 72.1  |
|         | Er    |      |      |      |      |      |      |      |      |      |      |      |      |       |

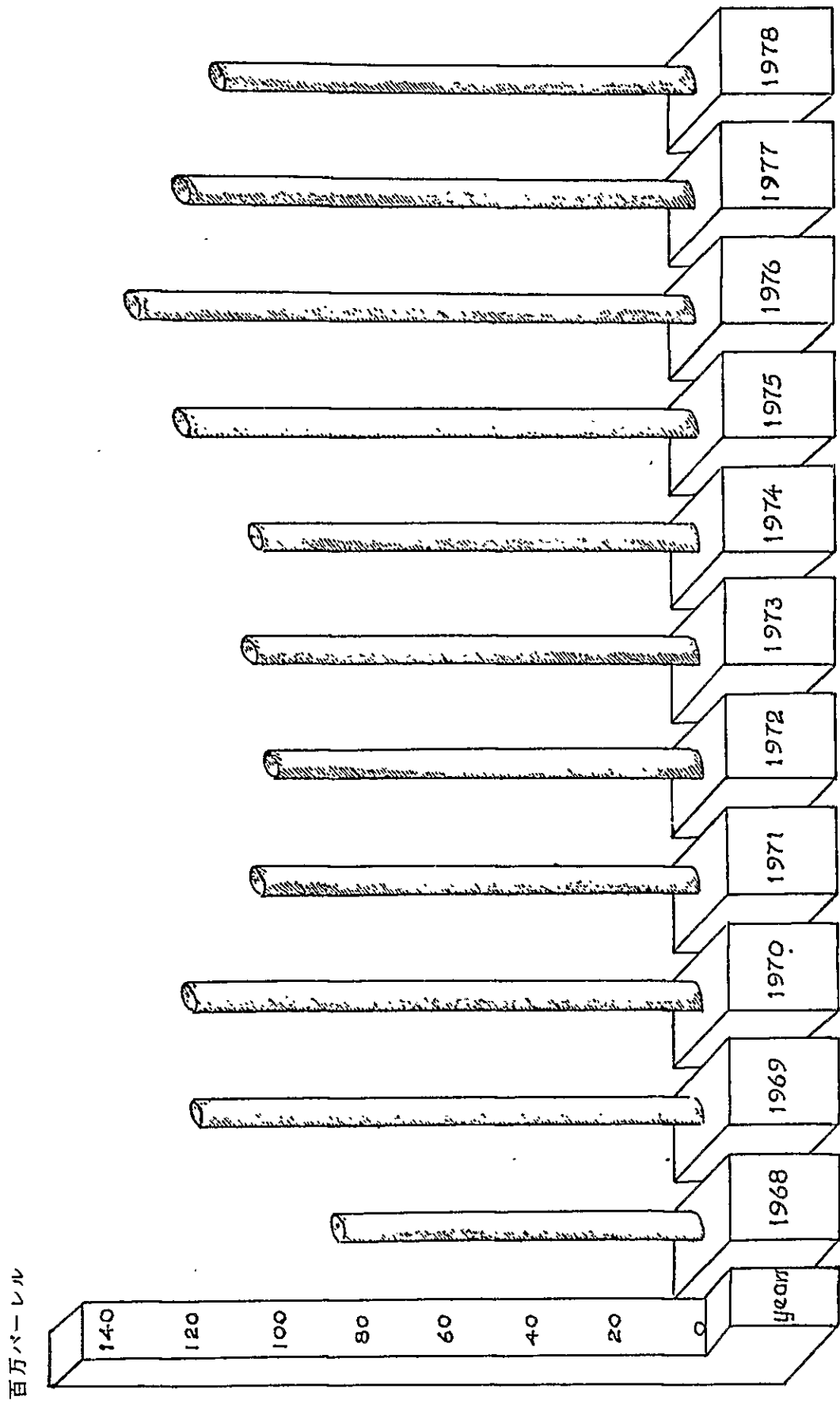
(注) Sohar : 1974~1975 (Eo : 1973~1975)  
Rostaq : 1974~1975  
Muscat : 1973~1977  
Salalah : 1974~1976  
Al Wati : 1974~1975

} の平均値

(6) 経済活動別会社の登録数（年度末における）



(7) 原油生産量 (1968 - 1978)



## (8) 輸出及び輸入

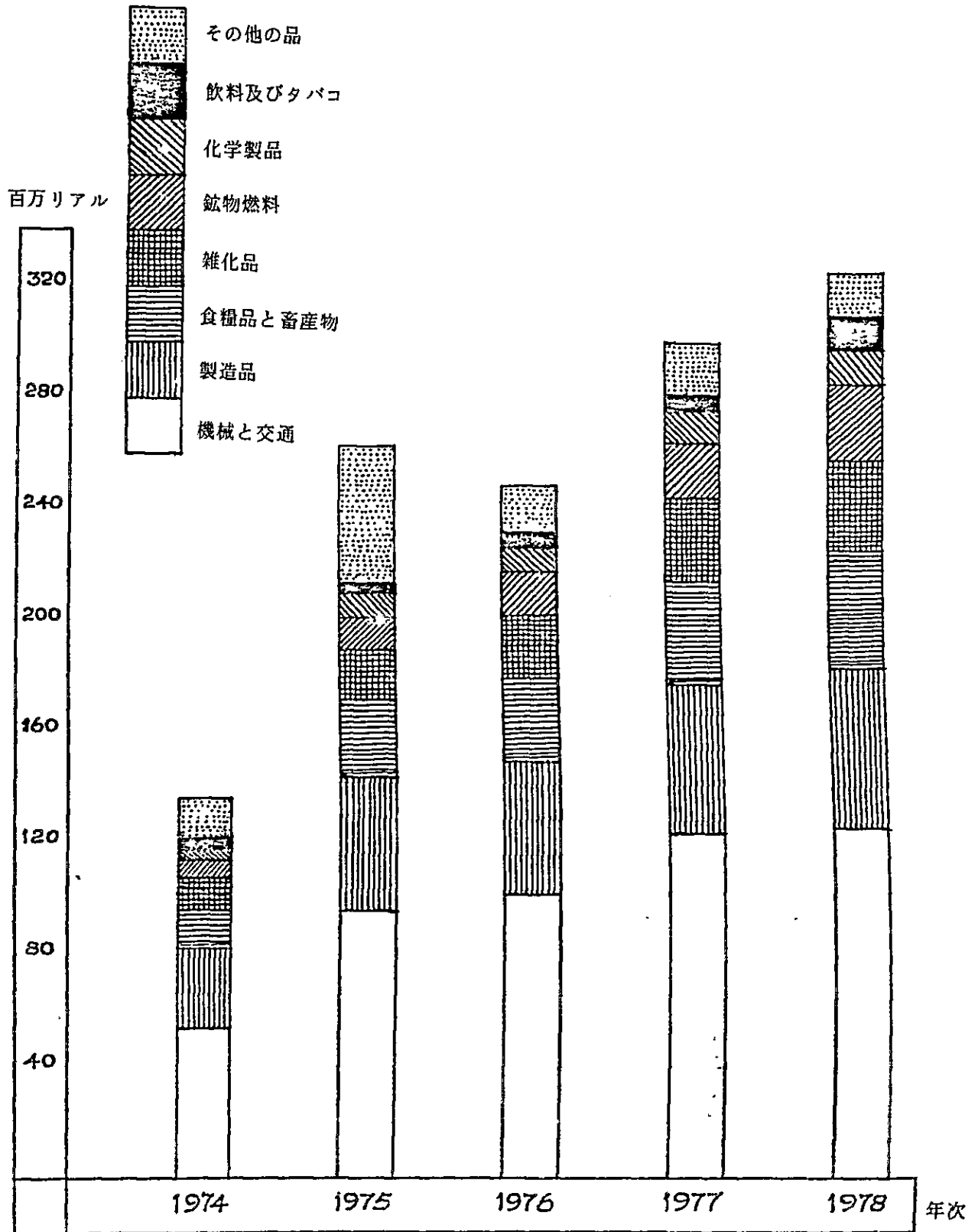
単位：百万リアル（O.R）

| 年次   | 輸入の合計 | 輸 出   |      |     |       |
|------|-------|-------|------|-----|-------|
|      |       | 油     | 輸出関連 | その他 | 計     |
| 1971 | 13.8  | 87.6  |      | 0.4 | 88.0  |
| 1972 | 18.7  | 88.2  |      | 0.4 | 88.6  |
| 1973 | 40.7  | 114.3 |      | 0.6 | 114.9 |
| 1974 | 135.6 | 418.7 |      | 0.4 | 419.1 |
| 1975 | 264.3 | 488.1 |      | 1.1 | 489.2 |
| 1976 | 250.5 | 543.8 |      | 1.4 | 545.2 |
| 1977 | 302.1 | 545.9 |      | 1.5 | 547.4 |
| 1978 | 327.2 | 521.8 | 26.9 | 3.3 | 552.0 |

- NOTES: 1. Figures for 1970, 1971 and 1972 are based upon dutiable imports and do not include imports by Government departments, contractors on Government projects, the oil companies and other duty free clearances.
2. From 1st July 1973 figures include all imports except some imports by Government departments. This accounts for part of the large increase in recorded imports between 1972 and 1973.
3. Gold imports are excluded.
4. The value of re-export is available for 1978 only.
5. The rate of exchange for Omani currency against the US \$ was fluctuating before July 1974. Average rates for 1970 — 1978 are given below:

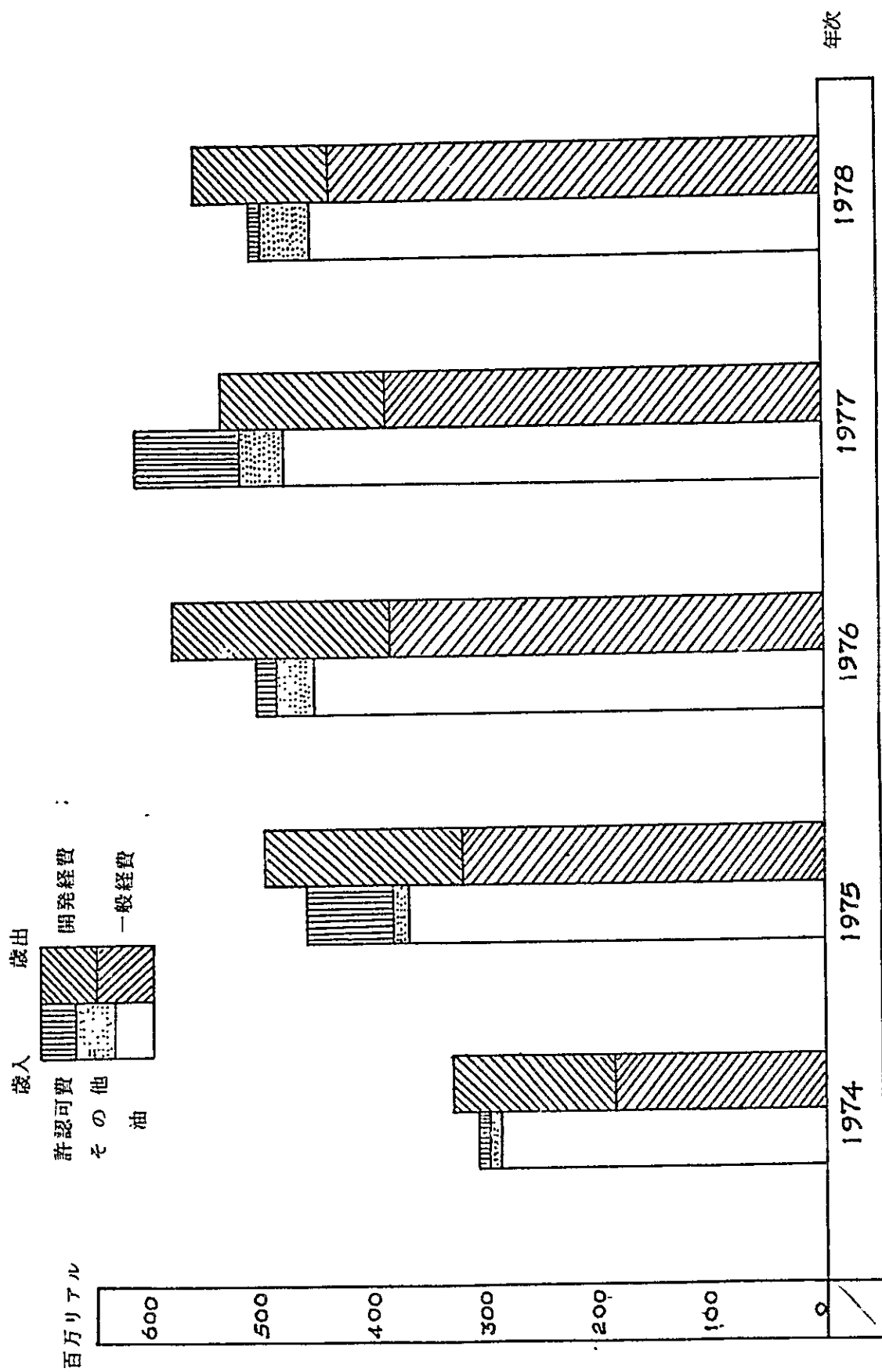
|         |     |           |        |
|---------|-----|-----------|--------|
| 1970/71 | ... | \$ = R.O. | 0.4167 |
| 1972    | ... | \$ = R.O. | 0.3838 |
| 1973    | ... | \$ = R.O. | 0.3460 |
| 1974/78 | ... | \$ = R.O. | 0.3454 |

(9) 輸入品目別柱状図





100 政府の歳出、歳入



(1) 政府の医療と公共保健機関及び病室数

|                  | 1970 | 1971 | 1972 | 1973 | 1974 | 1975 | 1976 | 1977 | 1978 |
|------------------|------|------|------|------|------|------|------|------|------|
| 病院               | —    | 5    | 10   | 12   | 13   | 13   | 13   | 13   | 13   |
| ヘルスセンター          | 9    | 10   | 7*   | 5*   | 11   | 11   | 11   | 12   | 12   |
| 施療所              | 10   | 13   | 27   | 30   | 32   | 40   | 42   | 45   | 47   |
| 公共健康複合機関         | —    | —    | —    | 2    | 2    | 4    | 4    | 5    | 5    |
| 公共健康機関           | —    | —    | —    | —    | —    | 6    | 9    | 9    | 13   |
| 検疫所              | —    | —    | —    | —    | —    | 6    | 6    | 7    | 7    |
| 公共健康中心センター (首都圏) | —    | —    | —    | —    | —    | 11   | 12   | 11   | 12   |
| 寝室数              | 12   | 216  | 526  | 664  | 934  | 1000 | 1252 | 1409 | 1409 |

Location of Government (Civil) medical and public health establishments and beds, regionwise during 1973

Hospitals : Sumail (50), Tanaam (50), Arrahma-Mutrah (118 of which 25 TB and 29 mental), Assada-Muscat (16), Muscat (24), Nizwa (50), Sohar (50), Al Nahda-Ruwi (178), Salalah (300), Sur (50), Buraimi (50), Khoula-Mina al Fahal (185), Rostaq (50).

Health Centres : Quriyat (6), Masnaa, Ibra (24), Bukha (16), Saham (8), Bahla (24), Sinaw (24), Bilad Bani Bu Ali (24), Bilad Bani Bu Hassan (24), Bayah (24), Khasab (24), Masirah (24)

Dispensaries : Sib, Barka, Shinas, Khabura, Af, Nakhl, Adam, Dank, Kamil, Mudaibi, Ibri, Al Khod, Suwaiq, Fanja, Izki, Hamra, Manah, Ghafat, Birkat al Mawz, Dariz, Mudairib,\* Taqa, Marbat, Mudhai, Thamrait (Midway), Abu Baqra, Shelim, Aiga, Wafi, Muhdah (4)\*\* Hibi (4),\*\* Mamur, Wadi Bani Ruwaha, Awabi, Hail-Ghaf, Madha (4),\*\* Sadha, Yanqal (4),\*\* Taiwi, Dhalkoot, Jebel Al Akhdhar, Bidiya, Dagmar, Rekhut, Hask, Kuria Muria, Al Ashkharah

Public Health Compounds : Sumail, Nizwa, Saham, Salalah, Buraimi.

Public Health Units : Sib, Bahla, Sohar, Mudhairib, Masirah, Sur, Dhank, Al Hamra, Quriyat, Khasab, Bilad Bani Bu Ali, Bilad Bani Bu Hassan, Al Ashkharah.

Quarantine Units: Mina-Qaboos, Mina-Raysut, Mina-Al Fahal, Sib Airport, Salalah Airport, Khatmat Al-Malahah, Wadi Hiti.

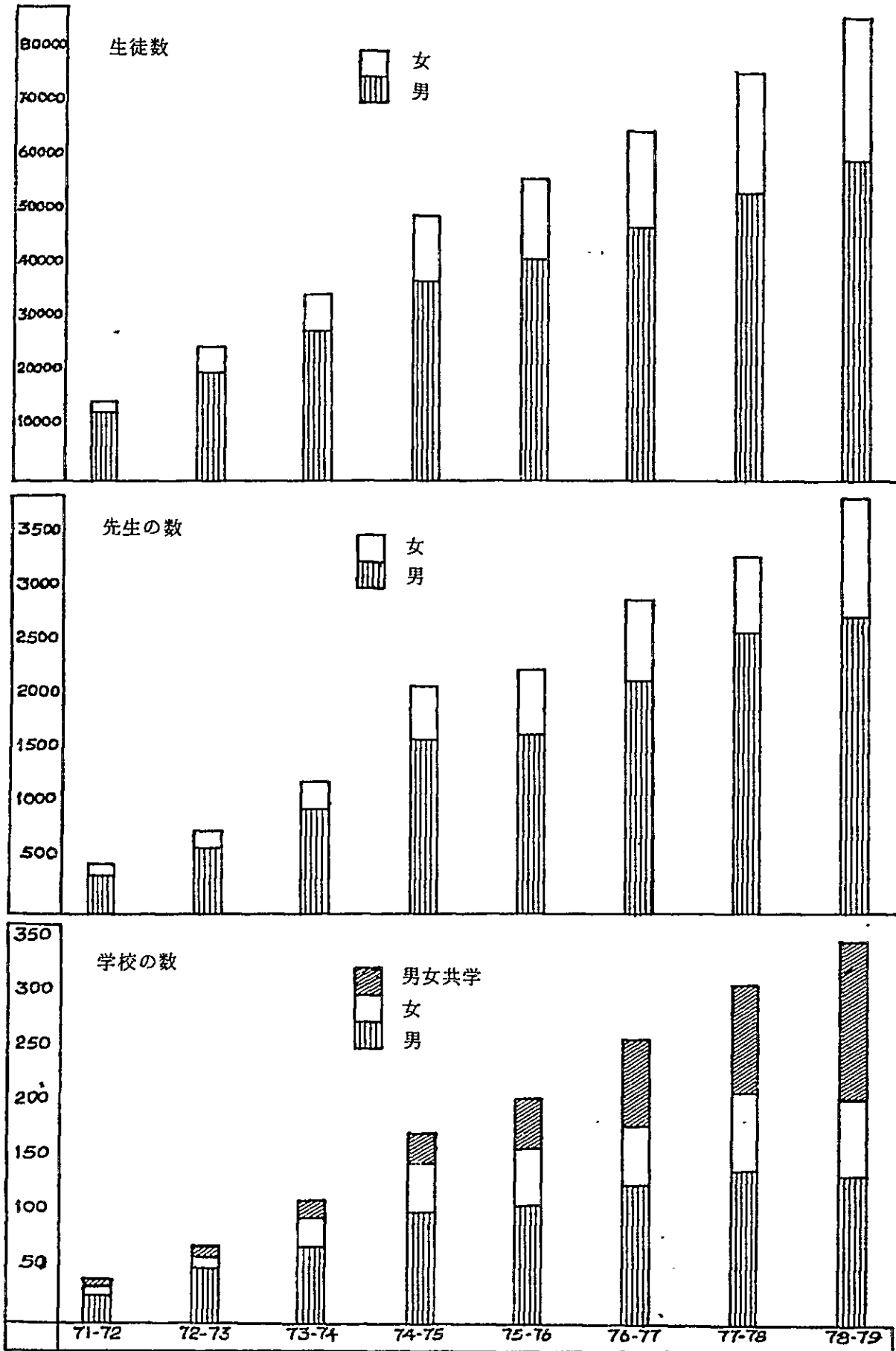
\* Three health centres were upgraded to hospitals during 1972 and two more during 1973.

\*\*Maternity centres

NOTES: 1. Figures in brackets show the number of beds.

2. Civil hospitals outside capital area also undertake public health work where there are no separate public health facilities.

(12) 政府の学校、生徒及び先生



## (14) 国営農場, 農業試験所, 普及農場, 普及センター及び育苗棟

| Type of Farm/Station              | Department of Agriculture Region |                  |                  |          |          |           |          |                 | Total |
|-----------------------------------|----------------------------------|------------------|------------------|----------|----------|-----------|----------|-----------------|-------|
|                                   | North<br>Batinah                 | South<br>Batinah | Oman<br>Interior | Dhahirah | Sharqiya | Janubiyah | Musandam | Capital<br>Area |       |
| Production farms                  | 1                                | 2                | 5                | —        | —        | 1         | —        | —               | 9     |
| Research stations                 | —                                | 2                | 2                | —        | —        | 1         | —        | —               | 5     |
| Extension farms                   | 1                                | —                | 1                | —        | —        | —         | —        | —               | 2     |
| Extension centres/<br>sub-centres | 7                                | 4                | 9                | 3        | 4        | 4         | 1        | 3               | 35    |
| Nursery gardens                   | —                                | 2                | —                | —        | —        | 2         | —        | —               | 4     |

**Geographical situation :****Production farms :**

Sohar (agriculture), Rumais (1) (3 agriculture), Nizwa (3 agriculture), Tanoof (agriculture), Jebel Al Akhdhar (agriculture).

**Research stations :**

Rumais (agriculture), Rumais (animal husbandry), Wadi Quriyat (agriculture), Wadi Quriyat (animal husbandry), Salalah (agriculture).

**Extension farms :**

Bahla, Buraimi.

**Extension centres :**

Al Mareer, Shinas, Liwa, Sohar, Saham, Al Khabura, Buraimi, Seeb, Barka, Masnaa, Rostaq, Nizwa, Manah, Izki, Hamra, Wadi Quriyat, Jebel Al Akhdahr, Sumail, Ibri, Sur, Al Wafi, Ibra, Sinaw, Khasab, Quriyat, Al Oqdain, Al Dahaleez, Taqa, Al Rabat.

**Extension sub-centres :**

Adam, Bahla, Dank, Yunqal, Al Khafigi, Bustan.

**Nursery gardens :**

Rumais (fruits), Rumais (garden), Rabat (fruits), Al Jebel (fruits).

**Note :** The Dairy farm in Sohar and Garwiz cow farms were excluded in this table while they appeared in last year issue of the Year Book 1977, since then it has been placed under the management of the Sun Farm Company (Oman).

地域別、作物及び作付面積

(注) 戸当面積はレポートの数をそのまま記載した。

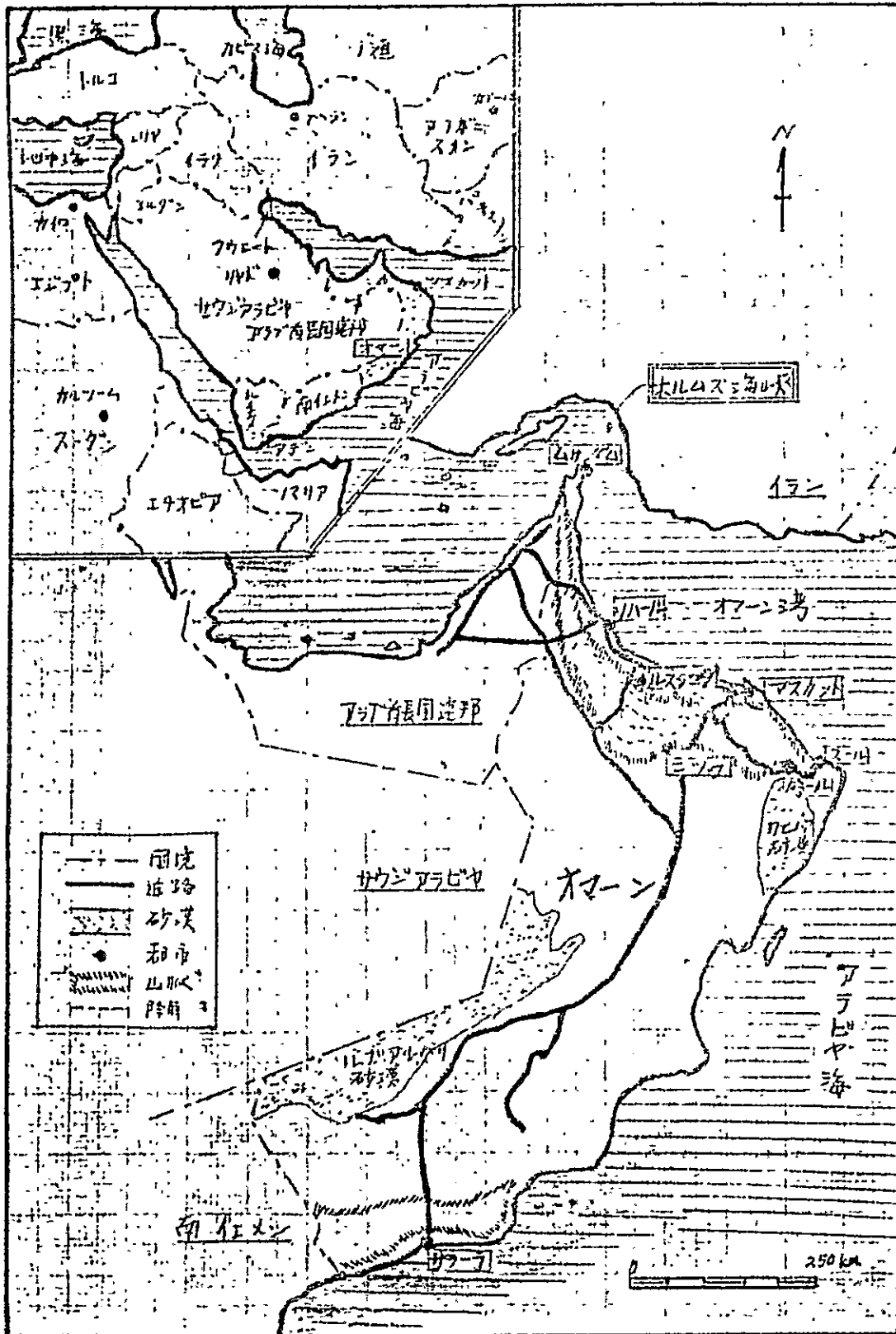
| 地域        | 地方局の都 | 耕地面積<br>ha | 同左<br>シェア-% | 作物別面積 (ha) |       |       |       | 農家戸数   | 戸当面積<br>ha | 作物名 (主要)  |
|-----------|-------|------------|-------------|------------|-------|-------|-------|--------|------------|---|
|           |       |            |             | 果物類        | 野菜類   | 野外植物  | 牧草類   |        |            |   |
| ノースバチナ    | ソハール  | 6,594      | 15          | 4,914      | 672   | 294   | 714   | 13,000 | 0.59       | デーツ, ライム, マンゴ,<br>グワーバ,<br>大根, トマト, メロン, 玉ネギ<br>タバコ, アルファルファ                        |
| サウスバチナ    | ルメイス  | 8,484      | 19          | 5,166      | 2,184 | 630   | 504   | 10,991 | 0.84       | デーツ, ライム, マンゴ,<br>バナナ<br>大根, トマト, メロン, 玉ネギ<br>ゴーズ, アルファルファ                          |
| ダヒラ       | イブリ   | 8,190      | 19          | 5,166      | 882   | 924   | 1,218 | 5,865  | 1.39       | デーツ, ライム,<br>大根, トマト, ニンニク, 玉<br>ネギ, 小麦, ソルガン,<br>アルファルファ                           |
| オーマンインテリヤ | ニスワ   | 6,468      | 15          | 4,788      | 630   | 126   | 924   | 9,772  | 0.59       | デーツ, ライム, マンゴ,<br>バナナ, パルス, コリアンデー<br>大根, トマト, ニンニク, 玉ネ<br>ギ, 小麦, エンドウ, アルファ<br>ルファ |
| シャルキヤ     | イブラ   | 11,046     | 25          | 5,712      | 588   | 2,814 | 1,932 | ?      | 0.84       | デーツ, ライム, マンゴ<br>バナナ<br>大根, トマト, メロン, 玉ネギ<br>ニンニク, アルファルファ                          |
| ドハール      | サララ   | 3,024      | 7           | 966        | 378   | 336   | 1,344 | ?      | ?          | ココナツ, パパイヤ, バナナ<br>グワーバ,<br>トマト, ナス, 玉ネギ,<br>トウモロコシ, アルファルファ                        |
| 合計        |       | 43,806     | 100         | 26,712     | 5,334 | 5,124 | 6,636 |        |            |   |

オマーン国における各種資料価格（概算額）

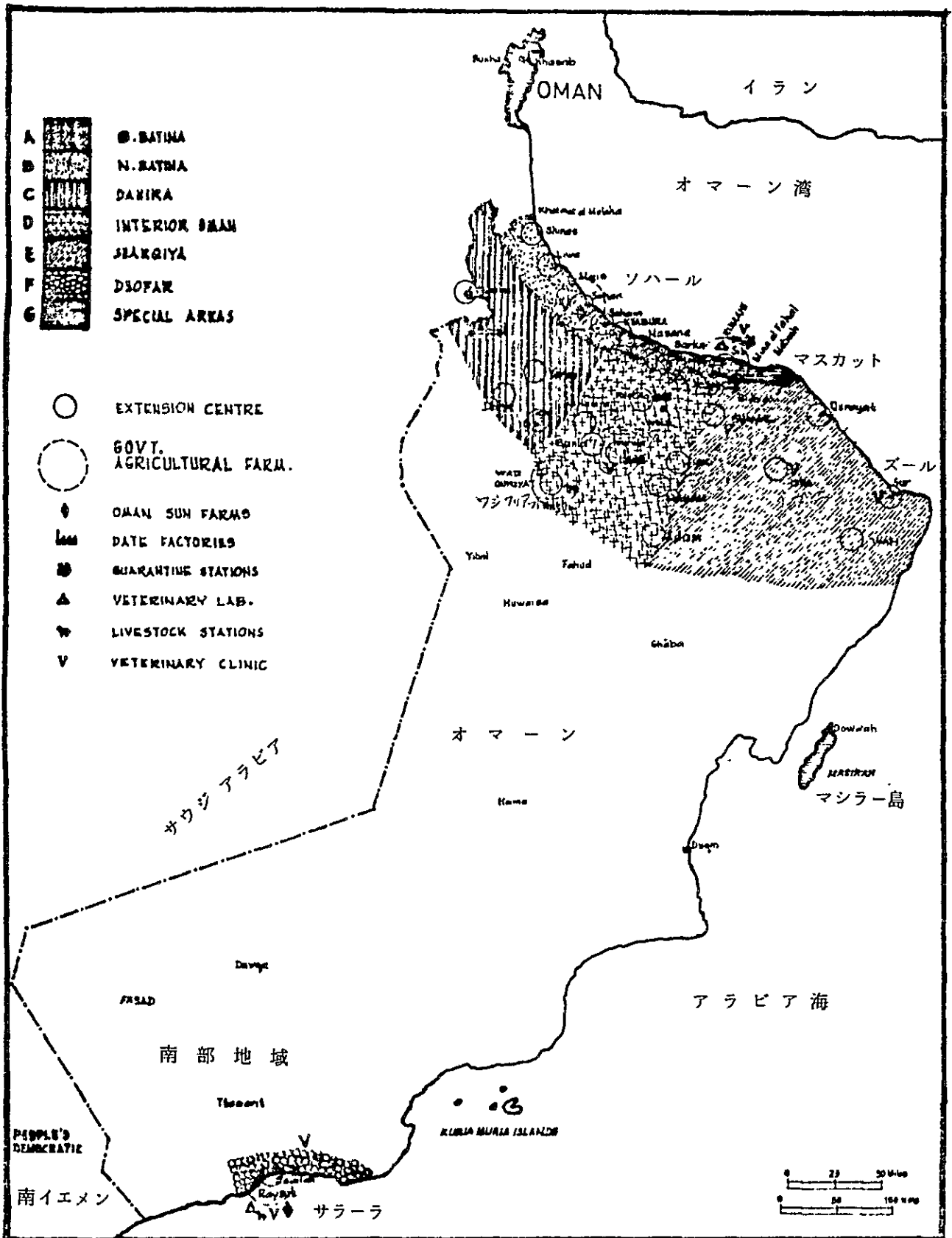
- ① セメント 3 2 Ro/トン
- ② コンクリート 2 7 Ro/トン（1 m<sup>3</sup> = 4 5,8 4 0 円）
- ③ パイプ 4,3 0 0 mmものは入手困難
  - a ビニールパイプ（φ 1 0 0 mm） 4 Ro/m
  - b スチールパイプ（φ 1 0 0 mm） 6.5 0 Ro/m
  - c アスベストセメントパイプ（φ 1 0 0 mm） 6.0 0 Ro/m
  - d ヒューム管 入手困難
- ④ 掘削単価
  - 幅 3 0 cm, 深さ 1 mの労務単価 4. 0 Ro/m
  - (注) 未熟労働者の最低賃金は 3 0 Ro/月

9. 参考地図

オマーン国一般図



農 業 分 布 図



出所：SULTANATE OF OMAN, MINISTRY OF AGRICULTURE & FISHERIES



