



AgEcon SEARCH
RESEARCH IN AGRICULTURAL & APPLIED ECONOMICS

The World's Largest Open Access Agricultural & Applied Economics Digital Library

This document is discoverable and free to researchers across the globe due to the work of AgEcon Search.

Help ensure our sustainability.

Give to AgEcon Search

AgEcon Search

<http://ageconsearch.umn.edu>

aesearch@umn.edu

*Papers downloaded from **AgEcon Search** may be used for non-commercial purposes and personal study only. No other use, including posting to another Internet site, is permitted without permission from the copyright owner (not AgEcon Search), or as allowed under the provisions of Fair Use, U.S. Copyright Act, Title 17 U.S.C.*

No endorsement of AgEcon Search or its fundraising activities by the author(s) of the following work or their employer(s) is intended or implied.

Vol XVII
No. 3

ISSN 0019-5014

JULY-
SEPTEMBER
1962

INDIAN JOURNAL OF AGRICULTURAL ECONOMICS



INDIAN SOCIETY OF
AGRICULTURAL ECONOMICS,
BOMBAY

ORCHARDING IN AN UNDERDEVELOPED ARID AREA*

Anthony Bottomley

This article contains an examination of why tribesmen in the Libyan Province of Tripolitania have failed to use orchard extension as a means of capital formation and consequent economic development. Many of the reasons for this failure are probably common to other arid areas throughout the underdeveloped world, and the following analysis will have application, no doubt, beyond the borders of Tripolitania.

The situation is examined on a crop by crop basis, and from the inquiry some general principles regarding the desirability of stimulating orcharding emerge. The crops which will provide our illustrations are olives, almonds, citrus and other varieties of fruits, grapes and dates.¹

THE OLIVE

The cultivation of the olive in Tripolitania dates back to Roman times and may even have been begun by the Phoenicians. There are trees still in existence which are believed to antedate the Crusades, and olive culture remains of great importance for both Arab and Italian farmers to this day.

The olive tree is peculiarly suited to local conditions. It is able to grow without the aid of irrigation in areas where an annual rainfall of more than 180 millimetres can be relied upon.² It can come to full production with little expense beyond the cost of local labour³ and it provides a good deal of employment in the off-seasons of the year. In other words, the social cost of the work which must be performed in the years before the trees produce is not a capital expense in the sense that labour need always be withdrawn from other production. The

* The author of this article wishes to thank Dr. John E. Moes, Economic Adviser to the Government of Somalia, for his invaluable comments on the line of argument which this paper contains. Throughout the article the expression L£ stands for Libyan pound, L.A.R.C. for Libyan American Reconstruction Commission, and L.P.D.S.A. for Libyan Public Development and Stabilization Agency.

1. In 1956 the production of olives was 18,500 metric tons, almonds—2,500, oranges—5,000, lemons—500 and dates—2,400 metric tons, United States Department of Commerce, Basic Data on the Libyan Economy, U.S. Government Printing Office, Washington, October, 1957, p. 2.

2. Two waterings a year will improve the crop, but one authority claims that irrigation of any kind is of doubtful virtue where capital is scarce. *Vide* United Nations Food and Agriculture Organization, Report to the Government of Libya on Agriculture, Report No. 21, Rome, 1952, p. 237.

3. Because of the existence of an artificial barrier to the expansion of tree planting in the shape of the tribal system of holding land in common, we cannot include a social cost for land in tree production (at the margin) above its opportunity costs per hectare in the shifting cereal cultivation and nomadic herding for which the common land is used. In other words, were this obstacle to further planting to be removed, new groves could be established on land which would probably command only negligible rents; although it must be admitted that the best land for olive tree production has already been taken up (according to an F.A.O. Free Crop Expert in Libya), and that yields at the margin would probably decline. It should be borne in mind, however, that this remark applies only to the olive and other trees which normally demand in excess of 180 mm. of rainfall per year; the almond, for instance, can thrive on 130 mm. a year, and it would probably not encounter significantly diminishing returns if its cultivation were pushed beyond the existing margin.

principal abstinence is from an otherwise high degree of leisure.⁴ The olive tree, then, utilizes land and off-season labour to a marked extent. The required measure of capital in terms of a necessary abstinence from consumption, and of managerial ability, is low. The first two factors of production are relatively plentiful in Tripolitania and the last two are comparatively scarce. One would expect, therefore, since olive production conforms so closely to the provincial comparative advantage, that the returns on resources applied to the cultivation of the trees would be competitive with those available in alternative endeavours. Unfortunately, however, this is not so in Tripolitania because the current techniques for extracting oil provide a product which is too acid for sale in the world market. But this does not alter the fact that the actual growing of the olives is in high accord with comparative advantage as far as places with similar geographical attributes to coastal Libya are concerned.

We should not make the mistake of assuming, however, that this kind of farming will develop of its own accord wherever soil and climate are suitable. Observers claim that the task of persuading Tripolitanian farmers, for example, to undertake the long term investment required for olive production would be formidable indeed.⁵ This reluctance of the local inhabitants to commit land and labour for long periods without return apparently also applies, to a greater or less degree, to all the tree crops covered in this article. The local variety of olive tree requires five to six years before it yields any fruit at all, even when it is irrigated, and ten to twelve years when it is not. The Italian variety takes longer still. Moreover, it will probably be some twenty-five to thirty years after planting before the trees come to full production.⁶ The young Arab farmer may not expect to live for a further twenty-five years, and it would be understandable if he felt, in the absence of a satisfactory market in partially matured trees, that an investment in olive production might yield little or no net return during his lifetime. However, as we shall see, little or no capital is required to plant and nurture trees, rather do they demand a sacrifice of leisure on the part of the Arab farmer, and it is probably his alleged impatience for a return, combined with the inhibiting nature of the land tenure system, which is really to blame for his failure to expand his orchards, not the lack of finance.

If, therefore, the local farmers are in fact affected by such considerations, then some method needs to be devised whereby the waiting period between investment and return can be reduced. The most obvious solution here would appear to lie in the development of nurseries in which a tree can be nurtured before being transferred to the olive grove. This can reduce the waiting period by anything up

4. The exceptions would be the spring tillage and pruning which would clash in their demand for labour with the cereal harvest. It may well be, however, that there is enough latitude in this regard to prevent the two activities from competing for available labour. After the tree begins to produce, of course, the autumn harvest will compete with cereal sowing and the gathering of citrus fruits. Otherwise, the digging of planting holes, the sowing and resowing of seeds, the winter ploughing and pruning, the summer pruning, any desired watering, as well as most of the guarding and training of trees, can all be undertaken in off-seasons of the year. See E. Mazzochi : Report to the Deputy Resident Representative of the United Nations Technical Assistance Mission to Libya on the Cost of Producing Olives, United Nations Technical Assistance Mission, Tripoli, December 5, 1955, *passim* (in the files of the Mission).

5. Alfred E. Broc : Orcharding in Tripolitania, Department of Agriculture, Tripoli, 1954, p. 9.

6. Mr. Mazzochi, the F.A.O. Tree Expert, claims that it will be twenty-five years after planting before the cost of bringing the trees to productivity is repaid, if, that is, a wage of fifteen piastres per day is paid and if interest on the capital invested is compounded at 8 per cent. *Op. cit.*

to three years. The nurseries themselves will, however, need financing and the publicly-owned banks in arid areas should investigate their probable monetary returns, together with the possible social advantage of any stimulus which they might give to the planting of trees.⁷

It might also be feasible to create a ready market for trees in varying stages of development; presuming that such does not already exist. The intrinsic value of maturing trees advances year by year, and if the farmer wants a current return from trees which have not reached the productive stage, he must sell part of his orchard to some one who, for example, has a seasonally under-utilized complement of labour and draught animals. The buyer could continue to develop the trees towards the productive stage before he too might feel inclined to sell. The effect would be one of rendering the trees similar to the sort of bond which advances in redeemable value as time goes on. Moreover, the owner might find the orchard a convenient repository for what might otherwise be idle resources during his period of tenure. If, therefore, the market does not as yet perform these very functions, and it seems likely that it does not, then the cause of its failure so to do : be it lack of credit to the buyer,⁸ or whatever, must be eliminated. Once the potential liquidity of investment of time and effort in tree cultivation has been raised to the level which a well developed market will allow, then a definite stimulus will be exercised on the expansion of certain types of socially (as well as monetarily) remunerative orchards.

Before trees in Tripolitania can be purchased with the aid of bank loans, however, it will generally be necessary to clarify land titles—to legally document just exactly who owns what⁹—and this will be a gigantic task in itself. Even then, the lender will be faced with the formidable task of foreclosing on land on which no one in the locality would be likely to bid.¹⁰

However, the productive power of the trees themselves can stand as excellent collateral for a loan, particularly if the lending institution handles the sale of the crop (as does the National Agricultural Bank of Libya) and extracts from the proceeds any money owed.

Just how useful a tree is as collateral on a loan depends to a large extent upon its type. As one authority puts it : "Farmers are often heard to state that if fifty per cent of their olive trees were of good varieties they would not be

7. The L.P.D.S.A. has already expended £1,000 on the establishment of an olive tree nursery. See Annual Report Covering the Financial Year Ending the 31st of March, 1953, Libyan Public Development and Stabilization Agency, Tripoli, p. 11.

8. Government banks should also be particularly helpful in assisting people to buy trees or land wherever this will aid in the consolidation of farmers' holdings. At present (according to a survey of the Zavia area) the average Arab cultivator farms between seven and eight scattered parcels of land, and much time and effort is expended on his movements between them. *Vide* Nicholas T. Theodorou : Report to the Government of Libya on Indigenous and Italian Farm Enterprises in the Zavia Area, F.A.O. Report No 259, United Nations Food and Agriculture Organization, Rome, 1954, p. 42.

9. Although the absence of well defined land titles need not always preclude a bank from lending for the purchase of trees ; they are sometimes sold apart from the land upon which they stand, and could themselves, presumably, stand as collateral for a loan. See L. M. Bologna : Outline of a Scheme for Land Settlement, United Nations Technical Assistance Mission, Tripoli, p. 11 (in the files of the Mission).

10. The Moslem is disinclined to bid on the land of a neighbour when a bank forecloses and offers it for sale.

facing financial and credit problems and could be confident of the future. But to achieve this end it would be necessary, in many cases, to have recourse to grafting."¹¹

But grafting involves a production loss of three to four years, and many farmers cannot afford to forego the current income. However, if the statement made in the above quotation is correct, then bank loans to cover some part of the farmer's various expenses during the grafting period will be highly remunerative as well as properly secured by the future productive power of the trees, and the banks might be persuaded to acquaint farmers with the advantages of borrowing for such a purpose. Another factor which banks might be encouraged to take into account when they allocate their loans to olive growers, is the nature of the borrower's other activities. Generally speaking, it would be a good thing if farmers who are mainly sheep herders and dry-land cereal growers were encouraged to add to their orchards. The olive appears to be affected by climatic conditions other than those which govern animal husbandry and dry-land cereal production, and it stands, therefore, as an excellent stabilizer for those farmers who devote part of their resources to its cultivation.¹²

It was estimated a few years ago that the acreage under olive trees in Libya could be expanded some two or three times. But this would, no doubt, involve planting trees on the common land. It seems likely that the holding of land in common is inimical to an increase in tree planting, but there seems to be no reason, apart from peasant conservatism, why the *cabilas* (sub-division of a tribe) should not work out some arrangement whereby the ownership of trees can be divorced from the tribal lands on which they might stand—as is already the case with some privately owned holdings. The trees could be inter-cropped until they become productive, and, thereafter, the owner might offer some ransom to the general coffers in order to persuade the tribesman to allow him exclusive use of the area. Alternatively, each tribal member might be granted rights to plant trees on "his" section of the common land, or, more radically, the tribes might sell land to individuals wherever rainfall is high enough to support trees. This would almost certainly result in a higher return per hectare than would be the case if the land were left to sheep grazing or shifting cereal cultivation.¹³

One authority claims, however, that Arab farmers can already make arrangements with their tribes to plant trees or make other improvements upon the common land. Nevertheless, trees are not planted there to any significant degree, and the implication given by the literature on the subject is that the Arab farmer feels

11. Umberto Marroni : The Olive Tree in Tripolitania—the Problem Variety, Provincial Department of Agriculture Library, Sidi Mesri, Tripoli, March, 1954. (Mimeographed.)

12. Olive production is, however, by itself, every bit as unstable as the other basic crops in Tripolitania. For example, olive oil production in 1948 was 2,000 metric tons, as against 5,500 metric tons in 1950, when the local price dropped to half its 1948 level. Report to the Government of Libya on Agriculture, *Op. cit.*, pp. 41 and 134. Because of this instability in production and prices the National Agricultural Bank has offered to make loans against oil stored either privately or with the Bank. These loans appear to have covered their accounting costs even though they may not have made the going rate of return. *Vide* Second Annual Report, National Agricultural Bank, Tripoli, 1959, p. 4.

13. For example, it takes between two and four hectares to support one sheep with an annual gross product valued at around £2.00 per year, as against a gross return of £13.125 per hectare on land under olives (according to information given by members of the Tripolitanian Department of Agriculture).

that his ownership of any improvements which he might make upon the common land may not be sufficiently secure.

Once the job of establishing the trees in the right varieties has been carried through, a number of minor tasks will still remain for the public or private lending institutions to perform. One expert on orcharding emphasizes the need for banks to finance the purchase of small tools.¹⁴ It is, for example, calculated that pruning olive trees raises their productivity by some 20 per cent,¹⁵ so it is not hard to see that capital invested in a pruning saw would have a very high marginal efficiency indeed. The banks might also encourage the purchase of rubber-tyred water carts which could be called upon to give olive trees the bi-annual irrigation which some authorities claim is so beneficial.¹⁶

ALMONDS

Up to now the almond tree has been grown largely in conjunction with the olive; that is to say, the ground between maturing olive trees has been planted with almonds. The almond bears fruit five or six years after planting and the growers hoped to derive some income from them while the olive trees moved towards full production. Thereafter it was intended to remove the almond trees so that they would no longer compete for the earth's nutriment with the fully grown olive. The difficulty is that the almond tree has become more remunerative than the olive as a result of the rise in the price of the nuts, and many growers are delaying the removal of their inter-cropped trees.

The almond has many advantages over the olive quite apart from the fact that it currently shows a higher return on annual outlays. To begin with, even more of the work involved in its cultivation can be undertaken when men and animals would otherwise be idle. Secondly, it can definitely be grown without the aid of irrigation, and it requires an even lower annual rainfall (130 mm.) than does the olive. Its production can, therefore, be pushed further out from the high rainfall areas. Thirdly, the annual output of the almond tree is more stable than that of the olive tree, and, in consequence, world prices fluctuate less.

In short, then, the almond can be produced with little other than the cost of sparsely watered land, underemployed labour, and one of the shortest waiting periods which is available on any tree crop. It is an arch example of production in high accord with the comparative advantage of arid areas. We should not be surprised, therefore, when the cost and revenue accounts provided by the Tripolitanian Department of Agriculture show high returns on capital alone,¹⁷ but while the private land upon which trees are grown continues to command an artificial price, it seems unlikely that this crop will get the attention it deserves.

In other words, despite the fact that almonds show estimated high percentage returns on capital invested, they only allow for comparatively poor expectations

14. Broc : *Op. cit.*, pp. 12 and 24.

15. According to Mr. Parini of the Tripolitanian Department of Agriculture.

16. Report to the Government of Libya on Agriculture, *Op. cit.*, p. 234.

17. Although it must also be said that world market conditions have actively favoured the almond, and that these conditions may not remain indefinitely; increased production in any single country, however, is unlikely to significantly affect world prices. See *The Almond in Tripolitania*, Department of Agriculture, Tripoli, 1955. (Mimeographed.)

regarding net monetary returns (£ 11.00) on each hectare of land involved.¹⁸ Our assumption of a high marginal efficiency for capital is, therefore, based upon a supposition that all the land of a satisfactory quality included in the common land (*i.e.*, above 130 mm. of rainfall per annum) might be used for growing almond trees, and that the immediate demand for this land would not be enough to elicit sizable rents. Clearly, if this were not the case and if annual net rents on such land exceeded £ 11.00 per hectare, then there would be no positive return on almond cultivation whatsoever. If, however, rents approximate to the existing opportunity cost of this land in grazing and shifting cereal cultivation, then net returns on outlays for almond production would be very high indeed.

CITRUS FRUITS

According to information supplied by the Tripolitanian Department of Agriculture, the net returns on the annual outlays required for the production of citrus fruits will be comparatively low and returns on citrus production would not appear to compare favourably with the dividends available on annual irrigated crops, such as groundnuts or tobacco, which do not require long periods of illiquidity before they reach fruition.

It would appear, then, that citrus groves in Tripolitania provide a yield which is low compared with those obtainable on capital invested in the cultivation of some other crops, although the reverse is true for the ground on which the citrus stand, and it is possibly this last factor which has encouraged their production in the past. But we have seen that high returns on land at the expense of relatively mediocre dividends on capital will involve a misallocation of resources if some way can be found of freeing the common land for all types of investment.

The effect of the current situation in Tripolitania, and, perhaps, in other similar areas, has not only been to divert private capital into relatively unremunerative lines of endeavour but also to encourage the expenditure of public funds in the same way. The Libyan Government, for example, tends to think of agricultural development in terms of schemes for the establishment of fully irrigated settlements, and such plans are carried forward in spite of the fact that these settlements are not expected to yield what might be called the going rate of return on the capital invested. Expensive resettlement schemes are also in direct defiance of the advice given by the subsequent leader of the United Nations Agricultural Mission to Libya,¹⁹ and, furthermore, there is a very grave danger that, at the present stage of development, the irrigation equipment necessary for such projects would be neglected. One might argue that Arab farmers will learn to take care of the equipment once they have it, but in the Fezzan Province of Libya a pilot scheme was tried with fourteen oil-driven pumps, and after a year all fourteen had fallen into disuse for want of proper handling and repair.²⁰ It seems, therefore, that only with a degree (probably high) of supervision and instruction could the equipment be expected to survive, and this will add to any subsidy requirements of the settlement schemes. Furthermore, the Libyan Government's plans to con-

18. According to estimates provided by Mr. Ugo Parini of the Tripolitanian Department of Agriculture.

19. O. J. Wheatley: Report on the Agriculture of Libya, F.A.O. Report No. 13, United Nations Food and Agriculture Organization, Rome, 1951, p. 128.

20. Report to the Government of Libya on Agriculture, *Op. cit.*, p. 238.

struct a freezing plant which would assist in the exporting of fruit might also be (although should not necessarily be) criticized on similar grounds.

At all events, there seems to be no clear-cut case in favour of the government subsidy to encourage the growing of citrus for export, or for pouring public money into the improvement of the citrus market, unless it is anticipated that these investments will show the going dividend. Citrus fruits are probably produced in defiance of the true provincial comparative advantage, and if citrus growers are to thrive, and their groves expand, let it be a solely private operation wherever conditions similar to those obtaining in Tripolitania are to be found.

MISCELLANEOUS FRUIT TREES

It is possible to grow a wide variety of fruit trees in Tripolitania. Apricots, peaches, plums, figs, and pomegranates will all grow well in the higher rainfall areas, or behind the water-spreading dams which the United States Operations Mission is constructing all over the province.²¹ One authority claims that apricots in particular show a high return:²² like plums and figs they can be dried in the hot North African sun, and may be exported without either canning or freezing.²³ But even if they are processed, they will allow a fuller utilization of any freezing or canning facilities which a country may possess, as well as staggered harvest labour, throughout the year.

Peaches can be grafted on to olive trees and they could provide an excellent alternative to producers in a declining olive market. The problem is, however, one of encouraging the necessary abstinence. The tree would, of course, be out of production in the period between grafting and the appearance of a crop of peaches, and the banks might be persuaded to finance the necessary waiting should the market price for olives not improve.²⁴

VITICULTURE

The great majority of the existing reports on trade and agriculture in Tripolitania were written during the early nineteen fifties. All of them gave the same explanation for the then unprofitable nature of vine cultivation. The wine producing industry had, it seemed, grown up largely in response to a domestic demand provided by the Italian troops stationed throughout Libya. After the Second World War these troops were no longer there and the industry languished.

21. These dams consist of low squat stone walls around which the water in a flooded wadi flows at certain times of the year. The water is thus spread over wider area. To the casual observer the main cost of these dams would appear to lie in the collection of the rocks involved in their construction, and in the piling of these rocks one on top of the other. Needless to say, such work can be carried on whenever labour and animals happen to be unemployed, and the production costs of the walls need not be a capital expense in the sense that resources must be withdrawn from other production. See United States Operations Mission, *Water Spreading in Libya, Tripoli, 1955, passim*.

22. Broc: *Op. cit.*, p. 70.

23. The problem of sand impregnation in the drying fruits, unfortunately, is a serious one. *Ibid.*, p. 49.

24. At present, public agricultural finance in Libya is provided, with varying degrees of success by the National Agricultural Bank and the Libyan Finance Corporation. The Commercial Banks, which are all branches of foreign institutions, do not care to lend to indigenous farmers because they feel that the risk is too great, and the only source of private credit to the Arab cultivator is the village moneylender.

Moslems are forbidden by religion—and in Cyrenaica by law—from drinking alcoholic beverages. The only remaining domestic market was, then, made up of the Italian settlers and the Anglo-American population, and they provided insufficient demand to take the then existing level of wine production off the market at a price which would cover costs. The export market was denied to the Libyan variety, which is of the ordinary type, by the tariffs which those countries which consume ordinary wine placed in protection of their own production. The inevitable consequence was that the cultivation of the vine within the province began to decline.

However, as supply decreased, prices first stopped falling, and then began to rise again, and officials of the Tripolitanian Department of Agriculture suggest that viticulture is once again a profitable occupation.²⁵

It is a pity that an export outlet cannot be found for Libyan wine or table grapes, so that former production levels could be established, because viticulture is eminently suited to Tripolitanian conditions, as well as, no doubt, to semi-desert areas elsewhere in the world. The vine will grow with little or no irrigation, the crop varies little from year to year, and, perhaps most important, it comes into production three years after planting. For this last reason, it was formerly widely grown in conjunction with tree crops which take a good deal longer to reach the productive stage so that the farmer might have a source of income while he was waiting for his olives or his citrus to mature. With a significant export market, the wine might once again provide such a stop-gap income to a multitude of potential orchard owners.

Most authorities are agreed that Libyan table grapes would not be able to compete in the world market, but it appears that the wine is as good as other North African varieties. It seems probable, therefore, that it could be sold abroad if it could be made more widely known and if it were granted most-favoured-nation, if not preferential, treatment in some markets, and this approach, no doubt, may be employed equally well by the other undeveloped countries in which wine might possibly be produced.

This is not to suggest, however, that governments engage in expensive advertising campaigns which might not pay off, but rather that they seek trade agreements which are more favourable to the sale of their countries' wine. There is a great deal of talk these days about European nations undertaking to extend more succour to their less fortunate neighbours in Asia and Africa, and developing nations like Libya might be able to exploit this sentiment with some such slogan as "trade—not aid." Scandinavia suggests itself, for example, as a particularly fertile ground for the sale of wine under these conditions. Not only are the direct colonial financial obligations of these countries small, or non-existent, but they also owe no allegiance to domestic or imperial wine producers. It might, however, be necessary to raise the quality of the wine above the ordinary standard so that it could more easily cover the cost of transport. This could be done if the maturing process were allowed to go on for longer periods. This would, however, create a demand for bank credit during the waiting period. If this were not

25. Although the Second Annual Report of the National Agricultural Bank claimed that export difficulties continued to be a depressing factor on prices in 1958. *Op. cit.*, p. 91.

forthcoming, much of the advantage of the wine as an early source of income to the tree grower could be nullified.²⁶

A further possibility in the field of foreign trade suggests itself in connection with the growing desire of the communist countries to expand their commerce with the underdeveloped world. Exports from the Soviet Union to Libya, for example, are increasing, and Czechoslovakia has recently expressed the hope that it will be able to buy L£ 150,000 of the latter's products per year. Both countries offer their goods at attractive prices and under generous credit conditions.²⁷

Such a situation might present an ideal opportunity for underdeveloped nations to get rid of products which, although of sufficiently high quality, fail to find a market because their reputation would be costly to establish. Libyan wine, for example, appears to belong to this category, and presumably a communist country would be prepared to accept it without the need for an intensive advertising campaign.

DATES

The date, together with barley, forms the basis of the Libyan diet. The Arab farmer and his family normally consume about two-thirds of their crop, and they attempt to sell the remainder.²⁸ There is, however, considerable evidence to show that the demand for this surplus is insufficient to allow a price which will cover costs.²⁹ Furthermore, this market demand would appear to be highly inelastic so that relatively small increases in supply can cause drastic falls in price.³⁰

The Tripolitanian date is of low quality and would be unable to find a foreign market at all were it not for the proximity of Malta and the fact that Italy allows the first 1,500 tons per annum into the country free of the 15 per cent duty which is applied to dates coming from other parts of the world.

The Libyan authorities have made a number of attempts to subsidize and otherwise encourage date production. Yet despite all their efforts, date cultivation continues to be commercially impracticable. These investments appear to give further indication that, although capital for fairly simple improvements may be scarce, the annual appropriation of aid funds (which must often rapidly be spent) leads to the saturation of sections of the economy with capital, and to the anomaly of low financial and social returns on some investments in a land where the marginal efficiency of capital appears to be quite high, and one gets the impres-

26. In Libya, for example, the grape harvest is currently financed by a co-operative, the *Cantina Sociale*, which would, presumably, qualify for the National Agricultural Bank's low interest rate loans to such institutions. See First Annual Report, National Agricultural Bank, Tripoli, 1958, p. 4.

27. Report on Economic Conditions in Libya during the Second Quarter of 1959, United States Embassy, Tripoli, July, 1959, p. 15. (Mimeo.)

28. R. L. Robb : Survey of Land Resources in Tripolitania, British Military Administration Department of Agriculture, 1945, p. 132. Reprinted by Poligrafico P Maggi, Tripoli, 1950.

29. However, production costs could, no doubt, be lowered if the Arab farmer could be persuaded to replace his water drawing by the *delu* with a Persian wheel. This latter can be operated by a continuously moving animal without constant human supervision. Costs could be further reduced if the current practice of selling by volume, which can mean anything up to seventy separate operations in the accumulation of a metric ton, were replaced by direct measurements in weight. Vide V. H. W. Dowson: Report to the Government of Libya on Date Processing and Packing, United Nations Food and Agriculture Organization, Rome, 1956, p. 27.

30. Dates for distribution sold at three times their 1950 levels in 1947, despite the fact that the interim increase in production was from 35,000 to 40,000 metric tons only. See Report to the Government of Libya on Agriculture, *Op. cit.*, pp. 41 and 134.

sion that this is a fault of aid expenditures in many other parts of the underdeveloped world.

SUMMARY AND CONCLUSIONS

Land and labour (particularly in the off-seasons) are the plentiful factors of production in Tripolitania, while capital and entrepreneurial or managerial ability are relatively scarce. It seems, therefore, that the law of comparative advantage would dictate that Tripolitanians as well as similarly placed producers elsewhere, should concentrate their efforts on the production of those crops which have a high land and off-season labour component.³¹ Almonds, for example, conform closely to this requirement, and they would appear to be the most profitable of all the tree crops. Citrus fruit production, on the other hand, requires considerable investment as well as a high degree of managerial ability, and it seems that their cultivation would certainly be less remunerative than that of many other crops if rents on land approximated closer to overall opportunity costs.

However, even where a crop appears to conform to the demands of comparative advantage, other factors may arise to prevent high returns from being realized. Perhaps the greatest problem in this regard is the tendency of Tripolitanians, in common with the inhabitants of most other underdeveloped countries, to cling to established practice. The method of olive oil refining, for example, yields an acid product which is hard to sell abroad. Since home demand is highly inelastic, it seems likely that expanded production will, in the absence of improved refining techniques, result in sharply falling prices. The Libyan likewise persists in producing a type of date which cannot compete in most foreign markets, and surpluses over and above subsistence must again face an inelastic home demand. Small expansions in production appear, therefore, to have reduced returns below production costs.

The traditional fragmentation of land holdings, as well as the established method of raising water (by the *delu*), both raise the effort and expense of orcharding, and the expansion of the more remunerative tree crops over wider areas is restricted by the fact that the greater part of the provincial terrain is held in common by the Arab tribesmen. Tree production is, then, artificially prevented from pushing to the profitable margin. Moreover, the vague legality of titles, even when land is privately owned, prevents its use as collateral for necessary loans on orchards which mature but slowly. But even if this last problem could be solved there would still remain the difficult task of persuading Arab farmers to invest in crops which might not yield a net return during the planter's lifetime, and a more liquid market for maturing trees may have to be provided.

All of these faults will need to be remedied if Tripolitanians, as well as farmers who face similar conditions in other parts of the world, are to make the best use of their resources in the field of tree production, and, in this article, we have tried to indicate the manner in which these remedies should be made.

31. The fact that labour is employed in off-season may raise the social but not necessarily the financial return on the crop, since wages may not reflect the changes in the demand for labour throughout the year. Banks should be encouraged to take this fact into account when deciding between alternative uses for their funds.