Annals of Arid Zone 25(4) : 294-299 1986

ECONOMIC APPRAISAL OF BER (*ZIZIPHUS MAURITIANA* LAMK.) CULTIVATION IN ARID RAJASTHAN

JAGDEESH C. KALLA, G. N. BHATI AND D. L. VYAS

Central Arid Zone Research Institute, Jodhpur-342 003

ABSTRACT

Economic appraisal of the recommended *ber* (*Ziziphus mauritiana* Lamk.) plantation technology for western Rajasthan was done. The estimated internal rate of return (21%) was 1½ times higher than the prevailing bank rate (14% per annum) on the long term investment. A *ber* plantation maintains its economic viability even if capital costs exceed long term bank rates by 6% per annum. The *ber* plantation also retains its economic resilience under a combination of natural, economic and market oriented constraints. Adoption of the technology, however, needs a sizable plant protection and insurance-credit-extension back up.

INTRODUCTION

Surveys conducted in part of western Rajasthan (Mann *et al.*, 1977) indicate degenerated arid lands that account for a sizable 45% of its total geographical area. Crop farming on degenerated lands not suitable for crop cultivation is a highly risky proposition. Options for land-based enterprise mix on such lands are also limited. The fruit tree *ber* (*Ziziphus mauritiana* Lamk.) has, however, proved to be one of the most promising enterprises and the cultivars Gola, Seb and Mundia can be successfully grafted on seedlings (*Ziziphus rotundifolia*) natural to grazing lands and cultivated fields (Pareek, 1976 and 1977). In this study, we report an economic analysis of production possibilities of *ber* plantation of arid lands not suited for field crops.

MATERIAL AND METHODS

The technology:

(i) Preparation of pits : Pits 60 cm dia x 60 cm depth dug at 8m x 8m spacing in June

(ii) Manuring : Pits filled with 0.65 cft of FYM mixed thoroughly with 100 g aldrin or BHC dust.

(iii) Planting : Of budded saplings, during August. Irrigations required 8-10 during I year, if rains fail.

(iv) Interculture : Hoeing in first two years, weeding in the years III-V

(v) Annual pruning : During May, after leaves shed; cut ends smeared with bordeaux paste. Pruned twigs collected as fuel-wood.

(vi) Plant protection : Phosphamidon or Dimethoate sprayed twice every year at 3-week intervals to check the damage by fruit fly after fruit setting; a third spray with malathion if required; One spray of karathane if powdery m'ldew appears.

(vii) Pickings of *ber* fruits : From the III year onwards, manually, from mid Jan to 15th March.

The data, primarily collected from field experiments at CAZRI, Jodhpur were normalised with the help of observations recorded on farmers fields in operational resesarch project villages around Jodhpur. The physical input-output data were transformed into return flows based on the prevailing market rates.

To judge the economic viability of '*ber*' plantations in arid areas, five well defined criteria viz., net present value (NPV), discounted benefit-cost ratios (DB-CR)., annuity (A), internal rate of return (IRR), and pay-back period (PBP) were employed (Gittinger, 1972). The sensitivity analysis was accomplished by assuming six discrete levels of changes in the benefit and cost cash flows (Table 2). Cash flows were discounted by 10, 14, 20, 25 and 30% per annum.

RESULTS AND DISCUSSION

Costs and Returns :

The maximum cost flows (Table 1) were for maintenance and watch and ward (35.34%) followed by harvesting (20.4%); the cost of planting was minimum (0.13%). The distribution of costs indicated more cost towards labour employed (80.76%) whereas planting material accounted for a relatively small proportion (19.24%) of the total expenditure over the planning horizon.

The returns accrued were estimated from selling of *ber* fruits and fuel obtained by pruning operation in the 6th year and onwards when growth of trees becomes vigorous.

The returns from *ber* fruits start from the first year, increase gradually upto 6th year and later ramain more or less stationary. The break up of returns indicate that maximum (92.95%) returns were realised from *ber* fruits. Fuel production, however, accounted for only 7.05 per cenr of total revenue flows (Table 1).

Economtc viability :

Table 2 would indicate that NPV retained its positive magnitude upto 20 per cent discount-rate. Thus per rupee investment would retain net returns of 47 per cent discounting which would experience gradual decline without losing its positive magnitudes upto 20 per cent discount rate. Further, at 10 per cent discount, the return above Rs. 2400 is ensured. The estimated IRR revealed that intrinsically this technology is endowed with returns more than cost of long-term borrowing of the capital. Finally, this technology is capable of paying back its investment lasting for 15 years in about 7 years. Assuming production span of 15 years, it can safely be said that for remaining eight years, the plantation would yield

Table 1. Costs and return structure (Rs/ha) for a ber orchard in western Rajasthan

Particulars	Blocks of 5-years			*Total
	I	II	III	
A. Costs : Site preparation	300	—	—	300 (0.39)
Plants	728	—	—	728 (0.95)
Planting	100	—	—	100 (0.13)
Weeding	1500	—	—	1500 (1.96)
Fertilizer	300	—	—	300 (0.39)
Insecticides	2005	2600	2600	7205 (9.43)
Irrigation	1440	—	—	1440 (1.89)
Thorn fencing	2500	2000	1000	5500 (7 20)
Pruning and spraying	1350	2450	2250	6050 (7.40)
Maintenance and watch and ward	9000	9000	9000	27000 (35.34)
Harvesting	4000	8700	9000	21700 (28.40)
Miscellaneous	300	500	500	1300 (1.70)
Tools and sprayers	2000	—	—	2000 (2.62)
Depreciation on fixed capital	480	600	600	1680 (2.20)
Total	26003	25850	24950	76803
B. Returns :				
Ber fruits	14355	57500	60000	1,31,855 (92.95)
Fuel	—	5000	5000	10.000 (7.05)
Total	14355	62500	65000	141,855
Difference (B-A) (-)	-11648	36650	40050	65,052

Labour @ Rs. 10/- per day, cost of budded plant Rs. 4/- per plant, farm yard manure @ Rs. 3/- per cft, selling of *ber* fruit @ Rs. 3/- per kg and fuel @ Rs. 100/- per quintal.

*Figures in parentheses present the per cent distribution of the costs or returns.

Factors affecting tractorisation

To establish relative importance of different variates in each of the zones, multiple regression equations with growth in number of tractors were generated using the step-down regression co-efficients for each zone and the region as a whole (Table 3). In zone I, the effect of net sown area (X_1) and cropping intenstty (X_3) were negatively significant, indicating that large area covered and existing level of cropping intensity may only result in a decline in the number of tractors in the long run. In zone II, only the cropping intensity may result in increased number of tractors. Similarly in zone III and IV, the tractors may register a decline with an increase in the number of draught animals. Finally, expansion of irrigation may invariably result in an increased demand for the tractors. It, thus, seems plausible to conclude that existing constraint in resource endowments, slow pace of irrigation and competitive usage of bullock power may dampen demand for tractors in arid region of western Rajasthan.

Net irrigated area and draught power significantly affected tractorisation at regional levels. Obviously, irrigated area was positively associated and draught power negatively associated with growth of tractors. However, the present growth of tractors in arid zone is governed largely by factors other than agriculture as indicated by the negative co-efficients of net area sown, total cropped area and cropping intensity at zonal as well as regional levels.

Tractorisation in the region may get momentum if area under irrigation is increased but it is unlikely since most of the area, particulary in zones I and II, is potntially irrigable only at a very high cost. Moreover, the negative influence of draught power on the number of tractors in zones III, IV and the region on the whole indicates a need to check the growth of draught power, if the procsss of tractorisation in arid agriculture is to be backed up significantly.

ACKNOWLEDGEMENTS

The authors are grateful to the Director, CAZRI, Jodhpur for providing facilities for the study.

REFERENCES

Bhattacharjee, J. P. 1949. Mechanisation of Agriculture in India-its Economics. *Indiau J. Agri. Econ. 5* (1) : 106-126.

Freeman, Harry. 1960. *Finite differences for Acturial students.* Cambridge University press, London.

Kalla, J. C., Joshi, B. R. and Goyal, Doulat. 1986. Comparative economics of traction energetics in arid western Rajasthan. *Ann. Arid Zone. 25* (1) : 61-68.

Krishnan, A. 1968. Delineation of different climatic zones in Rajasthan and their variability. *Indian Geography. 3* (1) : 33-40.