PROSPECTS FOR FARM FORESTRY ON RAINFED VERSUS IRRIGATED FARMS IN PAKISTAN[1]
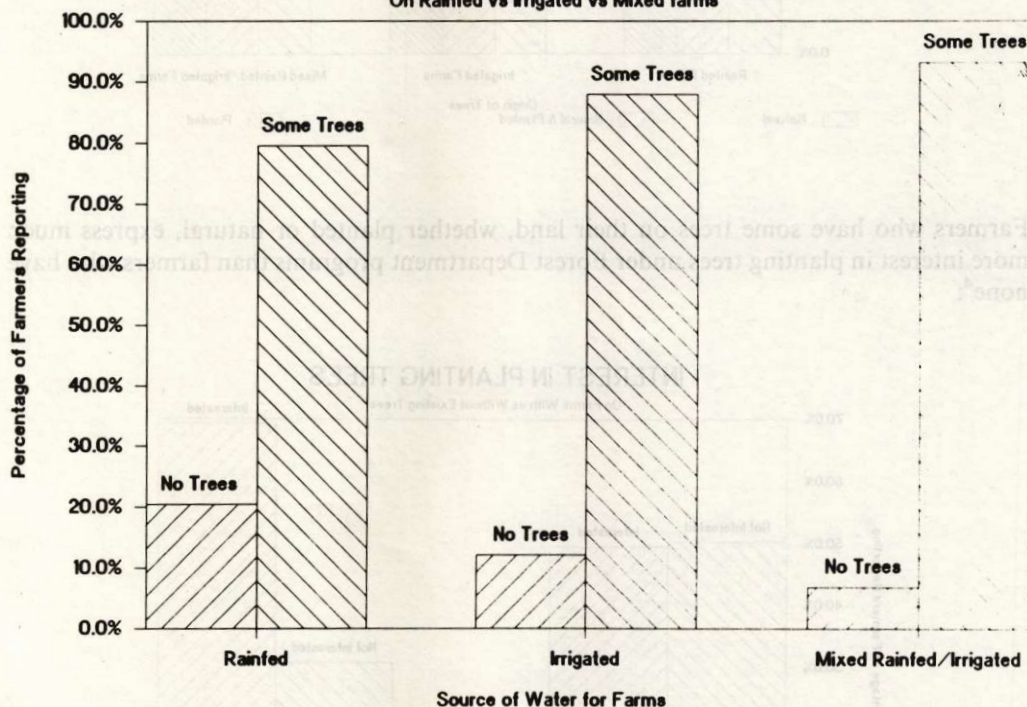
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I. Existing Trees on Rainfed Vs. Irrigated Farms

Farmers with irrigated lands are more likely to have some existing trees on their lands than those with rainfed lands, and mixed rainfed/irrigated farmers are most likely of all to have some[2].

NONE VS SOME EXISTING TREES
On Rainfed vs Irrigated vs Mixed farms

Similarly the likelihood that a farm's trees (among those farms with some trees) are planted as opposed to naturally grown is lowest on rainfed farms, higher on irrigated farms, and highest of all on mixed rainfed/irrigated farms. The farmers who have done the most tree-planting in the past, therefore, are those with mixed rainfed / irrigated lands[3].

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NATURAL VS PLANTED TREES

On Rainfed vs Irrigated vs Mixed Farms
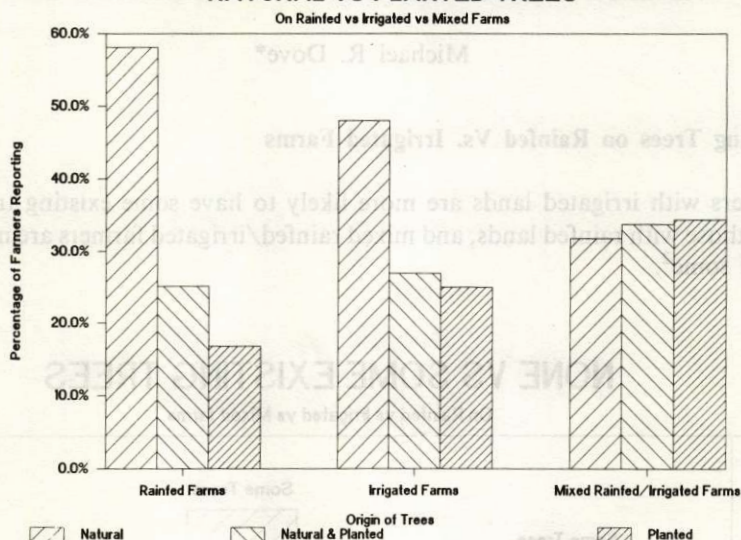
Farmers who have some trees on their land, whether planted or natural, express much more interest in planting trees under Forest Department programs than farmers who have none[4]:

INTEREST IN PLANTING TREES

On Farms With vs Without Existing Trees
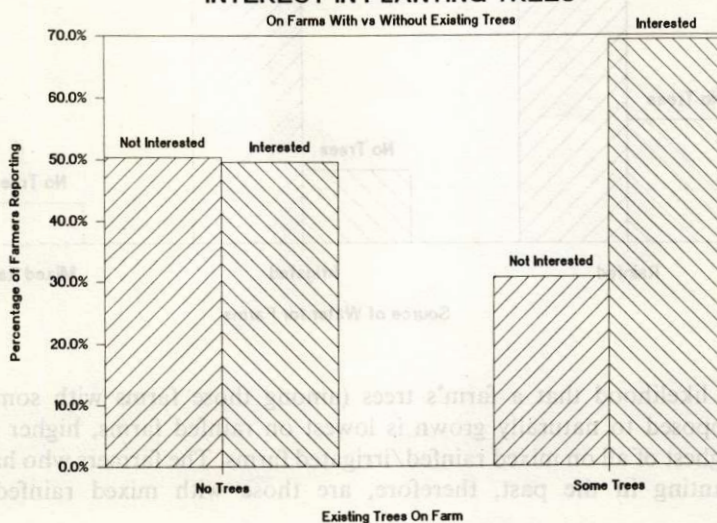
Since there are more likely to be trees on irrigated farms than on rainfed farms, and even more likely on mixed rainfed/irrigated farms, interest in planting trees is similarly higher on irrigated farms than on rainfed farms and highest of all on mixed farms (as noted in Dove 1988).

II.   Perceived Problems of Tree Cultivation

Farmers report that the number one problem in cultivating trees is tree-crop competition. On rainfed farms it is the trees' competition for water that is most feared, whereas on irrigated and mixed farms it is the trees's competition for sunlight. The number two problem is the lack of water, and it is reported to be almost as big a problem on the irrigated farms as on the rainfed ones: this reflects the fact that even where water is present, it is still a scarce resource (cf. Sheikh 1986: 27). The number three problem, the difficulty of protection, is more of a problem on the rainfed and mixed farms than on the irrigated farms, because block village rotation and free grazing are more common in the former areas than the latter (Supple et al. 1985: 31, 41). Lack of seedlings is more of a problem on mixed and irrigated farms, because sources of natural seedlings are fewer in number. Problems with pests/diseases are greater on the irrigated and mixed farms, because there are more termites - the most commonly mentioned type of pest - in such areas.

Number of Households Citing:	All HH	Household's Land Is:		
		Rainfed	Irrigated	Mixed
Impact on Crops	43%	53%	27%	36%
(competition for water)	(30%)	(35%)	(20%)	(20%)
(competition for land)	(31%)	(33%)	(30%)	(28%)
(competition for sunlight)	(39%)	(32%)	(50%)	(52%)
Lack of Water	39%	52%	16%	47%
Difficulty of Protection	38%	41%	30%	45%
Lack of Seedlings	11%	4%	21%	11%
Pests/Diseases	9%	6%	11%	16%
Bad/Salty/Waterlogged Soil	8%	3%	16%	3%
No Problems	7%	5%	11%	5%

Note: (1) The figures in parentheses are the percentage of 'Impact on Crops' responses in which competition for water, land, and sunlight are mentioned.
        (2) hh = households.

III. Perceived Impact of Trees on Soil, Soil Moisture & Crops

Farmers with rainfed lands tend to think that the impact of trees on the soil is negative, while farmers with irrigated lands tend to think that it is positive and those with mixed rainfed / irrigated lands fall in between[5]:

PERCEIVED IMPACT OF TREES ON SOIL
On Rainfed vs Mixed vs Irrigated Farms

The type of impact that trees are believed to have varies with farm type and attendant farm problems. Thus, the benefit of reducing erosion is cited mostly by farmers with rainfed lands (cf. Sardar 1986: 145-146), the reduction of salinity and increase in soil 'softness' by those with irrigated lands, and increase in fertility by those with mixed rainfed / irrigated lands:

Number of Households Believing Positive Impact of Trees is to	All Households	Households Whose Land is:		
		Rainfed	Irrigated	Mixed
Decrease Erosion	5% hh	27% hh	0% hh	7% hh
Decrease Salinity	18% hh	0% hh	24% hh	7% hh
Increase Softness	25% hh	7% hh	32% hh	7% hh
Increase Fertility	35% hh	60% hh	24% hh	67% hh

Note: (1) These figures apply to those households who believe that the impact of trees on the soil is 'positive'.

(2) hh = households.

There is similar variation in the negative impacts that trees are believed to have, with hardening and weakening of the soil being reported mostly by farmers with irrigated lands (65% and 18% of whom cite these respective problems). Kikar *'Acacia nilotica'*, Phulai *'Acacia modesta'*, and Kawan *'Olea cuspidata'* are the trees most often cited as having bad impacts on the soil.

But the overwhelming reason why farmers — of all types — believe that trees hurt the soil is by decreasing soil moisture. A majority of farmers of all types believe that trees reduce soil moisture. The size of this majority varies somewhat, in inverse association with acces to irrigation.[6] (Kikar *'Acacia nilotica'* is most often cited — in 78% of all cases) as causing these reductions in soil moisture.) Only among farmers with irrigated lands do significant numbers believe that trees increase soil moisture, and in most of these cases (76%) this increase is *not* regarded as desirable.

PERCEIVED IMPACT OF TREES ON MOISTURE
On Rainfed vs Mixed vs Irrigated Farms

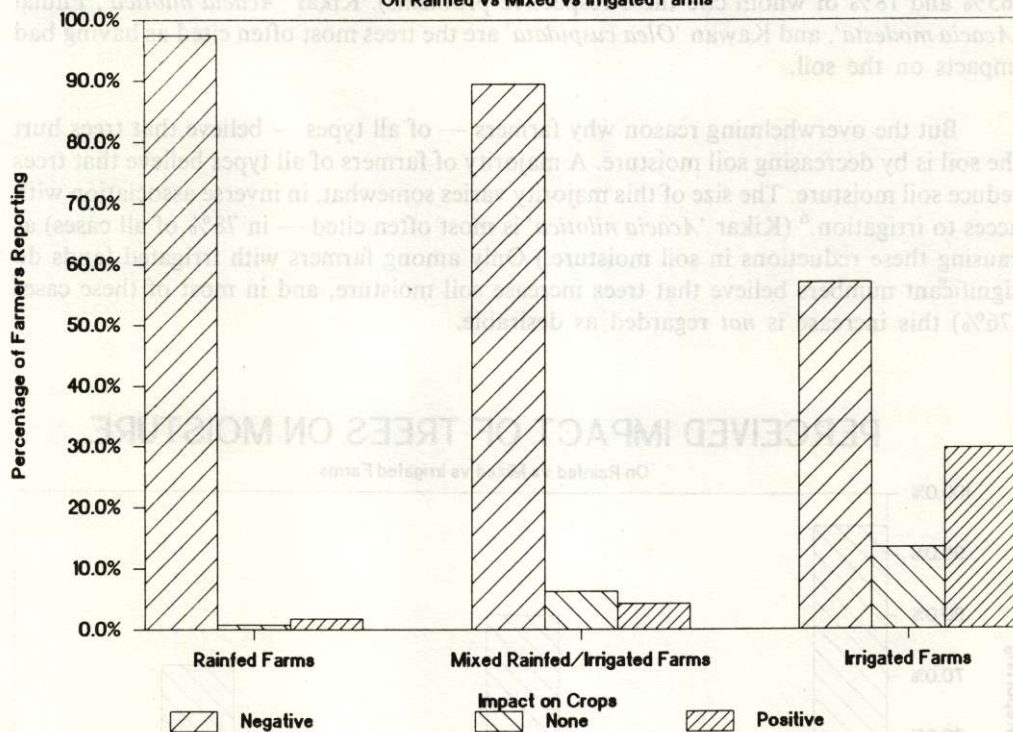Impact on Moisture: Decreases   None   Increases
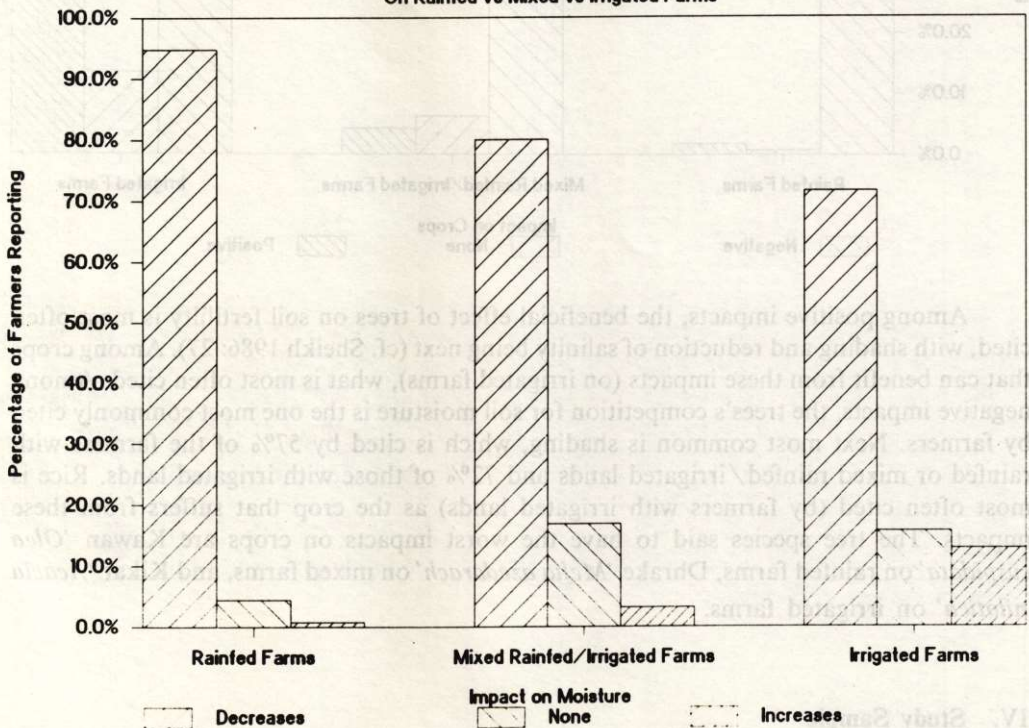
A majority of farmers of all types believe that the impact of trees on crops is negative. Only among farmers with irrigated lands does a significant minority believes that the impact is either neutral or positive[7]:

7

PERCEIVED IMPACT OF TREES ON CROPS
On Rainfed vs Mixed vs Irrigated Farms

Among positive impacts, the beneficial effect of trees on soil fertilily is most often cited, with shading and reduction of salinity being next (cf. Sheikh 1986: 27). Among crops that can benefit from these impacts (on irrigated farms), what is most often cited. Among negative impacts, the trees's competition for soil moisture is the one most commonly cited by farmers. Next most common is shading, which is cited by 57% of the farmers with rainfed or mixed rainfed/irrigated lands and 72% of those with irrigated lands. Rice is most often cited (by farmers with irrigated lands) as the crop that suffers from these impacts. The tree species said to have the worst impacts on crops are Kawan *'Olea cuspidata'* on rainfed farms, Dhrake *'Melia azedarach'* on mixed farms, and Kikar *'Acacia nilotica'* on irrigated farms.

IV. Study Sample

The data presented here are based on interviews with 1,132 households in 58 villages in the predominantly rainfed districts of the Punjab (districts Attock, Chakwal, Rawalpindi, Khushab, Sialkot, Gujrat, Jhelum) and NWFP (districts Kohat, Karak, D.I. Khan) and in the irrigated district of Nasirabad in Baluchistan. The villages were selected, based on field observations and interviews with Forest Department and local officials, as

being representative of their areas. The households were selected randomly from each village's voter's list. The researchers spent an average of 3-6 man-hours of time with each household, in the course of a minimum of 2 interviews.

V.   Recommendations

1.   Completely rainfed areas are in great *need* of farm forestry and hence should be selected for greatest *net* impact, while mixed rainfed / irrigated areas are the easiest in which to develop farm forestry and hence should be selected for quickest *success*, with completely irrigated areas falling in between.

2.   Familiarity with trees produces greater interest in planting them, so the initial aim of farm forestry projects should be to provide as *many* farmers as possible with *some* trees, and focus on farmers with *few if any* existing trees.

3.   The role of trees in the ecology of rainfed, irrigated, and mixed rainfed / irrigated farms differs, consequently outreach strategies, species selection, and technical advice — if not basic project design and benefits — should differ as well between rainfed, irrigated, and mixed areas.

4.   Farm forestry research and outreach should focus on the problems of concern to the farmers themselves: namely, reducing tree competition with food crops for water and sunlight; and reducing tree vulnerability to water stress and animal predation.

REFERENCES

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2.   Sardar, Mohammad Rafique 1986 Mountain Farmers' Perception of Soil Erosion and Response to Soil Conservation. Ph.D. dissertation, SUNY Syracuse.

3.   Sheikh, Mahmood Iqbal 1986 A Case Study on Hurries — *Acacia Nilotica:* Block Plantations for Wood Production in Pakistan. Peshawar: Pakistan Forest Institute.

4.   Supple, K.R.; A. Razzaq; Ikram Saeed; A.D. Sheikh 1985 Barani Farming Systems of the Punjab: Constraints and Opportunities for Increasing Productivity. Islamabad: Agricultural Economics Research Unit, National Agricultural Research Centre.

ENDNOTES

1.   This study was supported by the Forestry Planning and Development Project, jointly funded by the Government of Pakistan and US/AID, under the direction of the Office of the Inspector General of Forests. The author, project anthropologist for the Winrock International Institute for Agricultural Development, was assisted by project sociologist Jamil A. Qureshi, and by project researchers Riaz Ahmad, Sarfraz Ahmad, Nisar Ahmed, Abul Hassan, Zafar Masood, Shamsul Qamar, Nadeem Shahzad, Gul Mohammad Umrani, and Nazir Marvat. The author alone is responsible for the opinions presented here.

2.   This association is statistically significant. For n = 593 households (hh), X^2 = 13.0, P < .005.

3.   This association is statistically significant. For n = 948 households (hh), X^2 = 37.4, P < .001.

4.   This association is statistically significant. For n = 1027 households (hh), X^2 = 18.0, P < .001. Past experience with trees, even with naturally grown trees, provides sufficient evidence of their positive as opposed to negative characteristics to make most farmers willing to plant them. Among farmers who do not want to plant trees, therefore, their opposition or lack of interest is likely to be based on lack of familiarity as much as on empirical grounds.

5.   This association is statistically significant. For n = 285 households (hh), X^2 = 55.9, P < .001.

6.   This association is statistically significant. For n = .516 households (hh), X^2 = 52.7, P < .001.

7.   This association is statistically significant. For n = 576 households (hh), X^2 = 132.0, P < .001.