

**FARM LEVEL TREE PLANTING IN PAKISTAN:
The Role of Farmers' Perceptions and Attitudes**

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ABSTRACT

The low proportion of forested land and continuous degradation of existing forest cover are serious threats to the sustainability of forestry in Pakistan. Farm forestry has been identified as a feasible solution, particularly in the plain areas. Applying the Theory of Planned Behaviour in a survey of 124 farmers in Dera Ismail Khan district of Pakistan's North West Frontier Province showed that farmers' willingness to grow trees on their farms is a function of their attitudes toward the advantages and disadvantages of growing trees, their perception of the opinions of salient referents, and factors that encourage and discourage farm-level tree planting. Farmers viewed farm forestry as economically beneficial and environmentally friendly. Tree planting was perceived as increasing income, providing wood for fuel and furniture, controlling erosion and pollution, and providing shade for humans and animals. Farmers saw hindrance in agricultural operations and the harboring of insects, pests, and diseases as negative impacts of tree planting; however, these were outweighed by their perceptions of positive impacts. Tree growing decisions of farmers were influenced by the opinions of the family, owners/tenants, fellow farmers, and village elders. The factors that significantly predict farm-level tree planting were availability of barren land, lack of markets, lack of nurseries, and damage caused by animals and humans. Farm forestry programs are more likely to be successful if they acknowledge and address the factors which underlie farmers' reasons for planting or not planting trees.

Keywords: Theory of Planned Behaviour, farm forestry, adoption, innovations.

INTRODUCTION

Pakistan has a poor forestry resource and one of the lowest proportions of forest area in the world (Mcketta 1990). The existing forest cover is unable to meet the growing demand for wood and wood-based products in a country which is the seventh most populous in the world and the fourth in Asia with an annual population growth rate of 2.1% (GOP 2003). The current forest area is only 4.7% (GOP 2003) and is depleting due to a number of threats including continuous commercial overexploitation. Moreover, for a number of financial, technical, administrative, and political reasons, tree cutting in forests is in excess of replanting and regeneration rates (ERNP 1999). The result has been stagnated and disappointing output (Leach 1993) from the state forests which is not sufficient to fulfill the demand for timber and fuel wood, raw material for industries, energy requirements of agricultural sector, and fodder for livestock. The dependence on conventional fuels like firewood (which alone accounts for 50% of the rural fuel needs [Sheikh 1987]), cow dung, and agricultural residue highlights the importance of trees in solving energy needs of rural communities (Siddiqui 1997). Trees also contribute to economic

development from their role in the protection of watersheds, maintenance of biodiversity, and environmental quality (Bukhari 1997). Depletion and deforestation is not a recent phenomenon: it has been going on for centuries (Dove 1995b).

In order to reclaim degraded forest lands, ensure sustainable use of marginal lands, protect good quality land (Khan 1989), and fulfill the rural need for the economic and noneconomic benefits from trees to sustain their rural livelihood, tree planting on farm lands is the most feasible and viable solution under the present circumstances in Pakistan. Indeed, there has been an autonomous move in this direction: Dove (1995b:68) commented in the mid-1990s that “the locus of management of tree resources is in the processes of shifting ... to private farmlands.” Dove’s own data from 1,132 households in 118 villages in northern areas showed about 50% had planted nonfruit trees on their farms (Dove 1995b). He sees the government approach to farm forestry in Pakistan as in part an attempt to reassert control over tree resources.

Although the desirability of boosting tree planting on farmlands is recognized, both in the academic literature and in government policy, uptake has been lower than anticipated in many projects. Forestry research and education focuses mainly on technical forestry, and training of foresters mainly targets the meeting of staffing needs for the forestry service. The concept of people’s participation in projects has not been put into practice to an appreciable scale (Bukhari 1997). According to Amacher et al. (1993) “the policy makers rely on little more than casual intuition when they determine the best communities for introducing many forestry activities. The potential to create good development projects, but to anticipate their local acceptance in the wrong place, is great.” The forest policies of Pakistan (1955, 1962, 1991) emphasized the need to stimulate farm forestry and introduced legislation to do so (Ahmed and Mahmood 1998), but very little was translated into practical measures. Uptake and people’s participation in farm forestry activities are low because most social forestry projects were mainly focussed on biological and technical concerns and very little or no emphasis was placed on understanding the perceptions of local people or beneficiaries of the projects (Malik 1989). This view is echoed by Akbar et al. (2000) who suggest that the limited acceptance of agroforestry activities is due to the lack of attention given to farmers’ views of the factors that influence their decisions and, moreover, that projects mostly pay insufficient attention to local conditions, cultural values, people’s needs, and their participation in such projects (Akbar et al. 2000).

Arnold and Dewees (1998) argue that strategies to encourage tree planting on farms need to be based on an understanding of farmers’ tree management in the context of household livelihood strategies, pointing out that little is known about “farmers’ perceptions of the value of trees” and about the constraints they face in developing tree resources. Dove (2003) points to the inherently political nature of foresters’ misunderstandings of how farmers in Pakistan view trees on farms: those interpretations serve the interests of foresters by reinforcing the need for traditional state-owned plantation forests rather than the promotion of farm forestry. Politics at a local level have also been found to affect the outcomes of farm forestry interventions in Bangladesh. Khan (2001) shows, through three case studies, how local patronage can subvert the intentions of government social forestry, including promotion of on-farm tree planting. Patronage relations regulate access to project design, management, and benefits; can effectively determine the success or failure of local institutions; and act as a channel of communication and resource flow between government and local people.

Research on factors that encourage and discourage farm forestry in Pakistan has generally focused on social and physical parameters, leading to the ranking of constraints and benefits by respondents (e.g., Dove 1995b:71). Little research has explored farmers' actual decisions about the planting of trees and the perceptions and attitudes which contribute toward their decision-making. Dove (1995a) stated that "the most important variables in the development of on-farm forestry in Pakistan are not physical but human," interpreting the latter as cultural and socioeconomic factors such as land tenure. In terms of decision making, however, it is farmers' perceptions about these factors which are the primary influence: how do they think the nature of their tenure will affect the outcome of a decision to plant trees on their land? if they are tenants, how do they think their landlords will react to their desire to plant trees? Research needs to go beyond ranked lists of constraints and benefits, to explore how these interact to influence the individual decision. Then we can identify policy changes that would lessen those constraints that are most influential and reinforce the benefits. Such research can also contribute to the planning of communication and support strategies to enable farmers to make informed decisions that make sense in their own individual circumstances.

Thus, the future success of farm forestry in Pakistan will largely depend on assessing and addressing farmers' perceptions of the factors affecting farm level tree planting. This can be done through improving our understanding of farmers' perception and belief system underlying their attitudes towards farm forestry and the relationship of the two in forming an intention to grow trees on farmlands as well as the identification of the factors that encourage or discourage tree planting. Also, farmers living in rural areas of Pakistan discuss matters of daily life with their friends and fellow farmers when they meet together and are highly influenced by the family in making decisions. This points out the importance of social referents who may play a persuasive role in a farmer's decision to grow or not to grow trees. Insights about the above issues will be helpful in designing effective programs to boost the country's economy by strengthening the forestry sector in order to bridge the gap between the supply and demand of wood and wood-based products, and thereby contributing to the betterment of the farmers' standard of living and ultimately rural development.

This paper applies the Theory of Planned Behaviour (TPB) (Ajzen 1991) as a conceptual framework to examine the beliefs of farmers that are associated with the intention to grow or not to grow trees on their farmlands. These include beliefs underlying attitudes (behavioral beliefs), beliefs underpinning the opinions of important others (normative beliefs) and beliefs concerning factors that facilitate or constrain the performance of farm forestry (control beliefs). An assumption underlying TPB is that most human behavior is rational: individuals' behavior makes sense to them. Unlike early theories of adoption which suggested that some people were more prone, by reason of personal disposition, to try out new practices, and which led to classification of farmers into five categories from "innovators" to "laggards" (Rogers 1995:263ff.), these sociopsychological models help us to explore the rationality that underlies the individual's decision to engage, or not engage in a behavior. TPB and the associated Theory of Reasoned Action (TORA) have been widely used to explore decision making in agricultural and natural resource management contexts (Garforth et al. 2004; Daigle et al. 2002).

THEORETICAL FRAMEWORK

The TPB put forward by Ajzen (1991) explains that performance of a behavior is determined by the formation of intention toward the behavior, which in turn is a function of attitude toward the behavior, subjective norm related to the perception of important others and perceived behavioral control, which is the extent to which the individual feels they are able to put their intention into practice (Ajzen 2001).

The attitude component of the TPB is the degree of favorableness or unfavorableness toward a behavior (Fishbein and Ajzen 1975) and is computed by summing the products of the strength of beliefs about the perceived consequences of performing a behavior and an evaluation of those consequences (Stubenitsky and Mela 2000). This leads toward the measurement of attitudes quantitatively as a set of relevant beliefs—perception of the likely outcomes from planting trees on farmlands in the present case—multiplied by the corresponding evaluation of those beliefs—the perception of the importance or value of each outcome to the farmer. This helps in deeper understanding of what beliefs influence particular attitudes (Ajzen and Fishbein 1980).

Subjective norm (SN), a measure of perceived social pressure (Carr and Tait 1991), is also a function of beliefs, the normative beliefs (Ajzen and Fishbein 1980). A normative belief is the perceived likelihood that a particular referent individual or group would approve or disapprove of performing a given behavior (Heong and Escalada 1999). The SN is measured by summing the products of normative belief and motivation to comply with the opinion of important others known as salient referents¹.

Perceived behavioral control (PBC) which includes the factors that affect the successful performance of a behavior is calculated as the summated products of control beliefs (the perception of hindrances toward the performance of farm forestry) and power of control beliefs (perceived influence of each factor on the control toward the performance of farm forestry) (Ajzen 1991).

This paper uses the TPB to develop a structured method to analyze the components of attitude, SN, and PBC (Beedell and Rehman 2000; Stubenitsky and Mela 2000; Ajzen and Fishbein 1980; Ajzen 1988, 1991, 2001), in order to identify beliefs which are salient to farmers in respect of farm level planting of trees. The theory has been shown to be valid in circumstances where an individual does not have full volitional control over the behavior in question. In the present case, farm forestry behavior is assumed to be under partial volitional control. The problems which farmers feel they cannot overcome may include, for instance, knowledge, market unavailability, seedling supply, and water availability: these constitute factors outside their control whose presence or absence may encourage or discourage the performance of the behavior. In a rural society strong cultural norms and perceived pressure from social referents may also influence the performance of a behavior. The TPB provides a theoretical framework which accommodates these elements and offers an in-depth probe into the contribution of the various sets of beliefs outlined above in explaining farmers' perceptions toward farm forestry.

While there may seem to be factors outside the TPB components which have an impact on farmers' decisions to plant trees or not, many of these are in fact mediated through farmer

perceptions of them; for example, local political influences are reflected in farmers' reported SN while current policy constraints are reflected in their control and power of control beliefs.

METHODS

The objective of the study was to identify the beliefs that underlie farmers' decisions to engage in farm forestry, defined as the intention to plant trees on their farm in the next year or in the next ten years. Empirical research was carried out in Dera Ismail Khan (D.I.Khan) district situated in the south of Pakistan's North West Frontier Province (NWFP), in two phases. In the first phase, open interviews with 13 farmers who were already engaged in farm forestry (FF) and 12 who were not (NFF) elicited statements of beliefs in relation to the outcomes of planting trees on their farms in the next year and the next ten years, the people whose opinions influence their behavior in respect of tree planting, and factors they feel restrict their freedom to plant trees on their farm land if they wanted to. Statements recorded from multiple interviewees were regarded as salient and incorporated into a structured questionnaire for the second phase. The questionnaire included nine salient outcome belief statements, five salient referents, and nine salient control beliefs (see lists in Tables 1, 2, and 3). The control beliefs included those related to land tenure, inability to protect trees from damage, availability of barren land, and market factors, confirming the findings of other studies about constraints (Dove 1995b).

The second phase comprised an interview survey with 64 farmers who were already engaged in FF and 60 NFF. The samples were selected in three stages. Four administrative "circles" were randomly selected from the seven within the district; from each of these, two villages near to a metalled road and two far from a metalled road were randomly selected. In the 16 selected villages, lists of farmers were drawn up and farmers allocated to two strata—those who had engaged in FF and those who had NFF. From these lists, eight farmers (four from each stratum) were selected at random, giving a total sample of 128. Of these, four could not be interviewed leaving an effective sample of 124, of whom 64 were engaged in FF.

Those interviewed were, in all cases, the male head of household. This reflected the definition of the population as those who make decisions about the use of agricultural land held, whether as tenant, sharecropper or owner, by a household. Discussions with key informants in the area indicated that this population comprises male heads of households, notwithstanding the important role that female household members play in the agricultural economy of the household. Nationally, according to the 1980 agricultural census, women comprise 25% of all full time and 75% of all part-time labor in agriculture (ESCAP 1996). This is not the case, however, in NWFP where Hosein (1991) reported that work in the fields is a male domain and both men and women independently deny that women engage in farming. Women do, however, have a significant decision-making role in respect of livestock and poultry. In the context of the present study, the key decision makers in respect of the planting of trees were men who were recognized as holding land on behalf of their household.

The two components of attitudes, belief strength and outcome evaluation, were each measured using a five-point Likert scale (Likert 1931) ranging from "strongly agree" (5) to "strongly disagree" (1) for belief strength and "very good" (5) to "very bad" (1) for outcome evaluation.

The two components of SN were also measured on five-point scales ranging from “strongly agree” that the referent would approve (5) to “strongly disagree” (1), and “very much” (5) to “not at all” (1), for normative beliefs and motivation to comply respectively. Similarly the two components of PBC were measured on a scale ranging from “strongly agree” that the factor would be a hindrance to planting trees (5) to “strongly disagree” (1) for control beliefs and “extremely easy” (5) to “extremely difficult” (1) for power of control beliefs.

The data were analyzed using SPSS. As the variables were all measured on ordinal scales, median and IQR have been used as measures of central tendency and dispersion, rather than mean and standard deviations. For the same reason, Mann-Whitney U test has been used to assess the significance of differences between FF and NFF.

RESULTS

The respondents

The FF in the sample were significantly younger than NFF (38% and 13% younger than 35 years, respectively, $p < 0.01$), had significantly higher levels of education (60% and 32% with secondary education, $p < 0.01$), were more likely to own all of their farmland (75% and 5%, $p < 0.01$), and had larger landholdings (42% and 22% more than 30 ha; $p < 0.01$). They were also more likely to have occupations in addition to farming, with 64% of FF and 40% of NFF reporting to have nonfarm employment. A logistic regression model confirmed that tree planting is more likely among younger farmers, landowners rather than tenants, and those involved in off-farm employment (Zubair 2002).

Intentions toward planting trees on farm

Among both FF and NFF, a majority of respondents expressed either “strong” or “very strong” intentions to plant trees on their farm in the next year, though the proportions of FF were significantly greater than NFF (94% and 66% respectively; $p < 0.01$). Intentions to plant trees within the next ten years are slightly less strong (92% and 55% of FF and NFF expressing “strong” or “very strong” intentions; $p < 0.01$).

Beliefs underpinning attitude toward farm forestry

Analysis of salient beliefs showed a strong belief in the positive outcomes of tree planting for both FF and NFF (Table 1). Tree planting was viewed as economically beneficial and environment friendly. Most felt that planting trees on their farms would increase income, provide wood for fuel and making furniture, control erosion and pollution, and provide shade for human beings and animals especially when it is hot. However, negative impacts of growing trees were also recognized in that they can cause hindrance in performing agricultural operations, shade annual crops (thereby reducing yields), and provide harbor to insects, pests, and diseases that ultimately damage crops (Figures 1 and 2).

Table 1: Comparison of the belief strength (b_i), outcome evaluation (e_i) and attitudes ($b_i \times e_i$) of FF and NFF toward farm forestry.

Attitude statements	Belief strength (b_i)			Outcome evaluation (e_i)			Attitude ($b_i \times e_i$)		
	FF Median (IQR)	NFF Median (IQR)	Sig. (M-W)	FF Median (IQR)	NFF Median (IQR)	Sig. (M-W)	FF Median (IQR)	NFF Median (IQR)	Sig. (M-W)
“Planting trees on my farm will ...”									
Increase income	5 (5-5)	5 (4-5)	**	5 (5-5)	5 (4-5)	***	25 (25-25)	25 (18-25)	***
Provide fuel wood and furniture wood	5 (5-5)	5 (5-5)	ns	5 (5-5)	5 (4-5)	***	25 (25-25)	25 (20-25)	***
Control erosion	5 (5-5)	4 (4-5)	***	5 (4-5)	4 (3-5)	***	20 (20-25)	16 (15-20)	***
Provide shade for human beings and animals	5 (5-5)	5 (4-5)	*	5 (4-5)	4 (4-5)	**	25 (20-25)	20 (20-25)	**
Control pollution	5 (4-5)	5 (4-5)	ns	5 (4-5)	4 (4-5)	ns	20 (20-25)	20 (18-25)	ns
Cause hindrance in agricultural operations	4 (3-4)	2 (1-3)	***	4 (3-4)	2 (1-3)	***	16 (9-16)	4 (1-9)	***
Incur more cost	5 (4-5)	4 (4-5)	ns	5 (4-5)	4 (4-5)	ns	25 (16-25)	16 (16-25)	ns
Cause shade that will reduce the yield of crops	4 (4-5)	4 (3-5)	ns	5 (4-5)	4 (3-5)	**	16 (16-25)	16 (9-25)	*
Provide harbor to insects, pests and diseases	2 (1-3)	1 (1-2)	**	2 (1-3)	1 (1-2)	**	4 (1-9)	1 (1-4)	**
Σb_i	39 (37-40)	35 (32-38)	***						
Σe_i				38 (37-40)	33 (31-37)	***			
$\Sigma b_i \times e_i$							177 (161-189)	146 (128-168)	***

Significance of the difference in the distribution of scores of FF and NFF on the basis of Mann-Whitney U test (M-W);

*, **, *** denotes significance at .05, .01 and .001 levels; ns, showing nonsignificance.

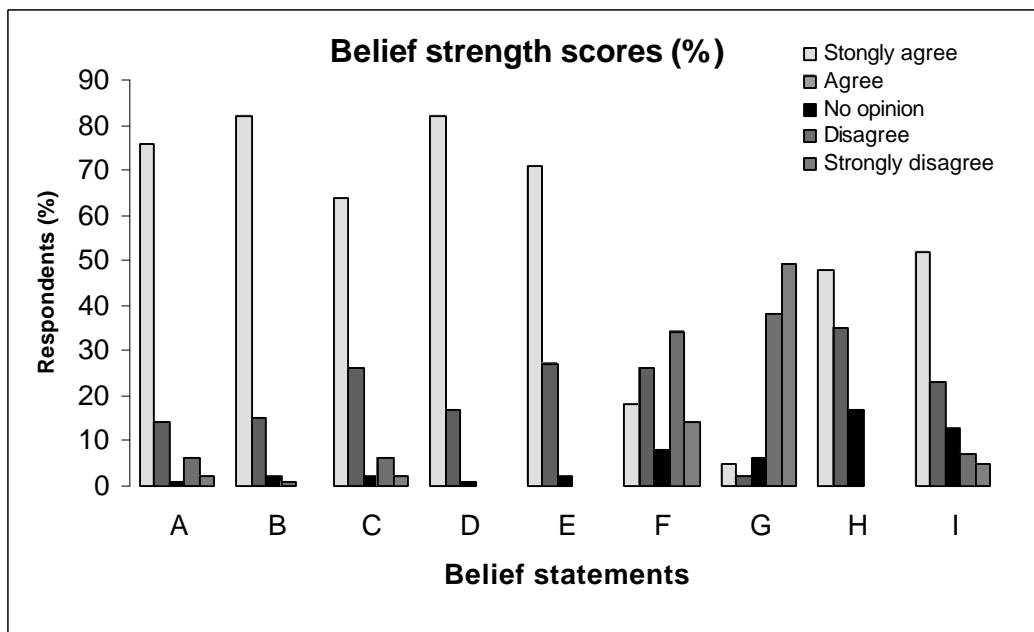
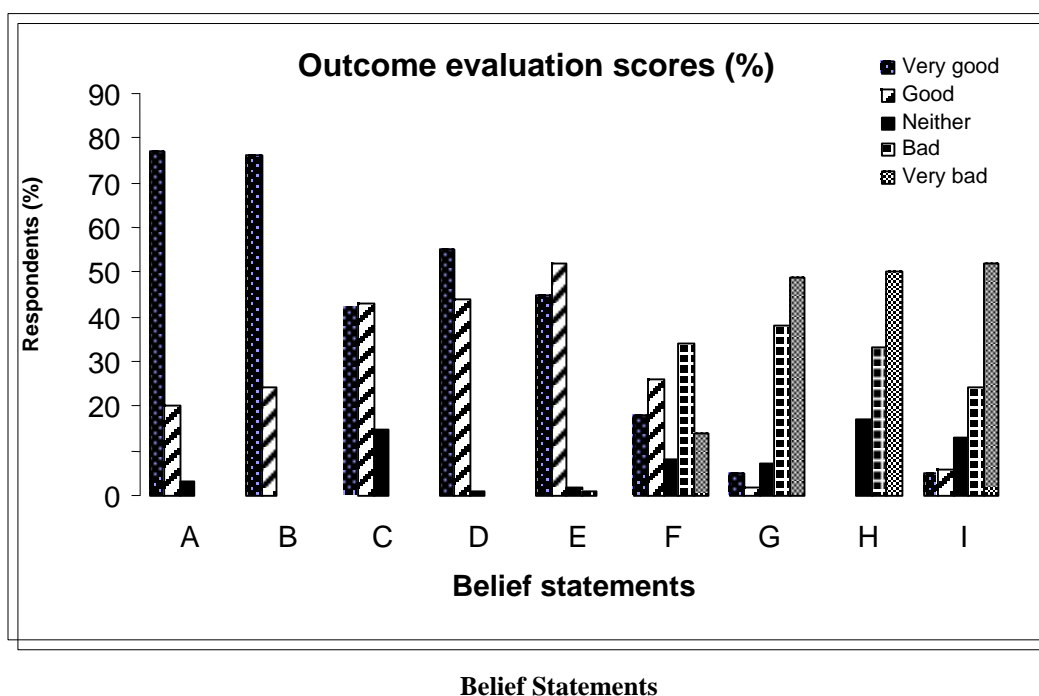


Figure 1: Belief strength scores of the farmers (n=124) regarding farm forestry.



- | | | |
|---|---|---|
| A= Income increase | B= Provide fuel wood and furniture wood | C= Control erosion |
| D= Provide shade for animals and humans | E= Control pollution | F= Cause hindrance in agric. operations |
| G= Incur more cost | H= Cause shade that reduce the yield of crops | I= Harbor insects, pests, and diseases of crops |

Figure 2: Outcome evaluation scores of the farmers (n=124) regarding farm forestry

When looking at median scores (Table 1), significant differences can be seen between FF and NFF regarding belief strength, outcome evaluation, and their summated product. The two groups differ in five out of nine modally salient beliefs regarding the strength of beliefs they hold. FF hold the view that trees can increase income (median [IQR]=5[5-5], $p<0.01$), control erosion (median [IQR]=5[5-5], $p<0.001$), and provide shade for animals and human beings (median [IQR]=5[5-5], $p<0.05$), more strongly than NFF.

NFF, on the other hand, perceive trees causing hindrance in agricultural operations (median [IQR]=2[1-3], $p<0.001$), and harboring insects, pests, and diseases of crops (median [IQR]=1[1-2], $p<0.001$), more significantly as adverse effects compared to FF (Table 1). In the outcome evaluation, there are significant differences in seven out of nine evaluative beliefs between the two groups. FF show higher scores than NFF in the evaluation of positive impacts of farm-level tree planting: increase in income (median [IQR]=5[5-5], $p<0.001$), provision of fuel wood and furniture wood (median [IQR]=5[5-5], $p<0.001$), erosion control (median [IQR]=5[4-5], $p<0.001$), and provision of shade for animals and human beings (median [IQR]=5[4-5], $p<0.01$) (Table 1). In contrast, three beliefs about negative effects of farm forestry—hindrance in agricultural operations (median [IQR]=2[1-3], $p<0.001$), shading crops to reduce their yield (median [IQR]=4[3-5], $p<0.01$), and harboring insects, pests, and diseases of crops (median [IQR]=1[1-2], $p<0.01$)—were significantly more negatively evaluated by NFF than FF. The only evaluative statements where differences were statistically nonsignificant were those concerning pollution control and a higher cost as a result of planting trees on farmlands (Table 1). Regarding the summated product of belief strength and outcome evaluation representing attitude toward tree planting on farmlands, FF scores were higher (Table 1) than NFF (median [IQR]=177[161-189], $p<0.001$).

Beliefs underlying SN

The salient beliefs underlying SN are presented in Figures 3 and 4. Significant differences in SN were observed between the groups in respect of all five salient referents (Table 2). FF generally perceive greater social pressure from social referents and have a greater motivation than NFF to comply with their views or suggestions on planting of trees on their farms.

The differences in SN can be further elaborated by examining the normative beliefs and motivation to comply of the two groups with different salient referents. Apart from the Forest Department, the groups differ significantly in their normative beliefs about social referents. Comparison of the median scores and IQR for normative beliefs show that FF believe more strongly than NFF (median [IQR]=20[17-22], $p<0.01$) that all reference groups including family (median [IQR]=4[4-5], $p<0.001$), tenants and owners (median [IQR]=4[3-5], $p<0.05$), fellow farmers (median [IQR]=4[3-5], $p<0.05$), and village old man (median [IQR]=4[4-5], $p<0.01$) think that they should plant trees on their farmland (Table 2). Statistically nonsignificant differences were observed as far as Forest Department is concerned and both FF and NFF were mostly not sure whether the Department would approve their planting of trees on farm. This reflects the ambivalence of professional foresters toward farm forestry reported in the literature (Dove 2003).

Table 2: Comparison of the normative beliefs (b_j), motivation to comply (m_j) and subjective norms ($b_j \times m_j$) of FF and NFF.

Salient referents	Normative beliefs Median (IQR)			Motivation to comply Median (IQR)			Subjective norms Median (IQR)		
	FF	NFF	M-W	FF	NFF	M-W	FF	NFF	M-W
Family	4 (4-5)	4 (3-5)	***	4 (4-5)	4 (2-5)	***	20 (12-25)	16 (8-20)	**
Tenant/ owner	4 (3-5)	4 (2-5)	*	4 (2-5)	3 (2-5)	***	15 (8-20)	11 (4-20)	**
Fellow farmer	4 (3-5)	4 (3-5)	*	4 (2-4)	3 (2-4)	**	12 (8-20)	10 (8-16)	**
Forest Department	3 (3-3)	4 (3-3)	ns	4 (3-5)	3 (3-4)	***	12 (9-15)	9 (9-14)	**
Village old man	5 (4-5)	5 (4-5)	**	4 (4-5)	4 (2-5)	*	20 (12-25)	20 (10-25)	**
Σb_j	20 (17-22)	19 (16-21)	**						
Σm_j				20 (16-22)	18 (15-21)	***			
$\Sigma b_j \times m_j$							80 (59-94)	63 (53-88)	**

Significance of the difference in the distribution of scores of FF and NFF on the basis of Mann-Whitney U test (M-W); *, **, *** denotes significance at .05, .01 and .001 levels and ns, showing nonsignificance.

Table 3: Comparison of the control beliefs (c_i), power of control beliefs (p_i) and perceived behavioral control ($c_i \times p_i$) of FF and NFF.

Salient control beliefs	Control beliefs Median (IQR)			Power of control beliefs Median (IQR)			Perceived behavioral control Median (IQR)		
	FF	NFF	M-W	FF	NFF	M-W	FF	NFF	M-W
Provision of barren land	4 (4-5)	4 (3-4)	***	4 (4-5)	4 (3-4)	***	16 (16-25)	16 (9-16)	***
Unavailability of market	2 (1-3)	1 (1-2)	***	2 (1-3)	1(1-2)	***	4 (1-9)	1 (1-4)	***
Long term business	2 (1-3)	3 (2-4)	**	3 (2-4)	3 (1-3)	ns	5 (3-8)	8 (3-12)	ns
No awareness	3 (3-4)	4 (3-4)	ns	3 (1-4)	3 (1-4)	ns	9 (4-12)	9 (4-12)	ns
Absentee landlord	3 (3-4)	3 (3-3)	ns	3 (2-3)	3 (3-3)	ns	9 (6-12)	9 (6-12)	ns
Long-time land utilization	3 (2-4)	2 (1-3)	**	3 (2-4)	2 (1-3)	**	9 (4-16)	4 (1-9)	**
Damage by humans/animals	2 (1-2)	2 (1-4)	***	2 (1-3)	1 (1-2)	***	3 (2-4)	3 (1-6)	ns
Lack of nurseries	4 (2-4)	2 (1-3)	***	2 (2-3)	2 (1-3)	ns	8 (4-10)	4 (2-6)	***
Acquisition of less income	3 (3-4)	4 (3-4)	ns	3 (3-4)	4 (3-4)	ns	12 (6-16)	12 (9-16)	ns
Σc_i	26 (23-29)	24 (21-28)	*						
Σp_i				26 (22-29)	23 (20-26)	**			
$\Sigma c_i \times p_i$							80 (65-90)	71 (56-85)	**

Significance of the difference in the distribution of scores of FF and NFF on the basis of Mann-Whitney U test (M-W); *, **, *** denotes significance at .05, .01 and .001 level and ns, showing nonsignificance.

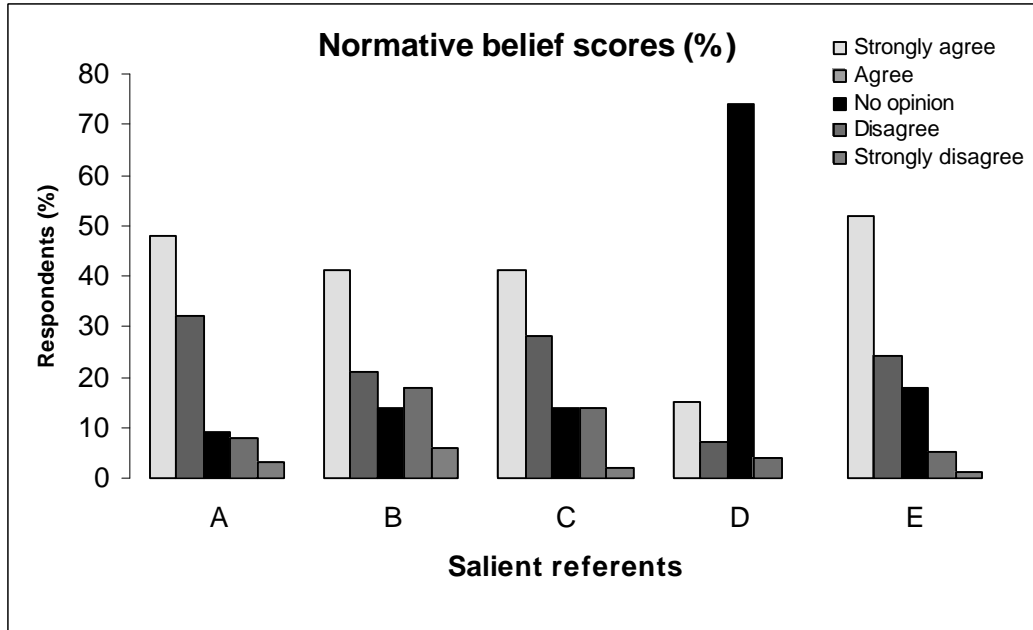
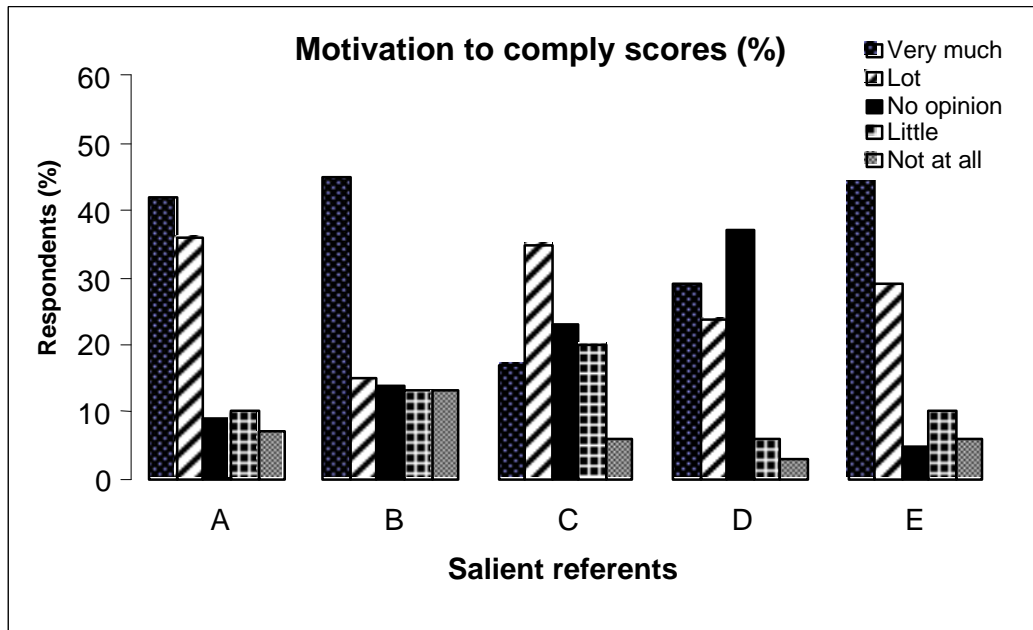


Figure 3: Normative belief scores of the farmers (n=124) regarding farm forestry.



Salient referents
 A= Family B= Tenant/ owner C= Fellow farmer
 D= Forest Department E= Village old man

Figure 4: Motivation to comply scores of the farmers (n=124) regarding farm forestry.

Regarding motivation to comply, both FF and NFF were motivated to comply with the opinion of all salient referents (median [IQR]=20[16-22], $p<0.001$) pertaining to farm forestry (Table 2). From Table 2, it can be seen that FF are significantly different from NFF regarding their motivation to comply with the opinions of family (median [IQR]=4[4-5], $p<0.001$), tenants/owners (median [IQR]=4[2-5]; $p<0.001$), fellow farmers (median [IQR]=4[2-4]; $p<0.01$), Forest Department (median [IQR]=4[3-5], $p<0.001$), and village old man (median [IQR]=4[4-5], $p<0.05$) concerning growing trees on their farms. It is interesting to note that FF are more compliant to the opinion of others as compared to NFF, a phenomenon contrary to the characteristics of Rogers' (1995) "early majority," who he suggested are less constrained by the opinions of others and make their own decisions. This may be because growing of trees on farmlands involves a certain degree of uncertainty, due to which farmers seek more opinions of others in order to reduce the uncertainty before deciding to go ahead and plant trees. This view is consistent with other findings reported by Rogers (1995).

Beliefs concerning the factors that hinder or facilitate the performance of farm forestry

Farmers largely believe in the existence of factors that prevent or facilitate the planting of trees and which they consider make tree planting either easy or difficult (Figures 5 and 6). There are significant differences between FF and NFF regarding control beliefs and power of control beliefs. The two groups differ significantly in four out of nine salient control beliefs. FF are significantly higher than NFF in their perception of the availability of barren land as a facilitating factor (median [IQR]=4[4-5], $p<0.001$), and their perception of the difficulty caused by the damage to seedlings by animals and human beings (median [IQR]=2[1-2], $p<0.001$) (Table 3). NFF, on the other hand, are significantly more likely than FF to see as preventive factors the unavailability of market {median (IQR)= 1(1-2), $p<0.001$ }, tree growing as a long-term business (median [IQR]=2[1-3], $p<0.01$), long-term utilization of land (median [IQR]=2[1-3], $p<0.01$), and lack of nurseries (median [IQR]=2[1-3], $p<0.001$) than FF (Table 3).

The two groups also differ significantly in four out of nine power of control factors. FF are more encouraged by the availability of excess land (median [IQR]=4[4-5], $p<0.001$) than NFF, whereas NFF are more likely than FF to express the view that preventive factors such as unavailability of market (median [IQR]=1[1-2], $p<0.001$), long-time land utilization by trees (median [IQR]=2[1-3], $p<0.01$), and damage by animals and humans (median [IQR]=1[1-2], $p<0.001$) will make it difficult or very difficult for them to plant trees on their farmland in the next year (Table 3).

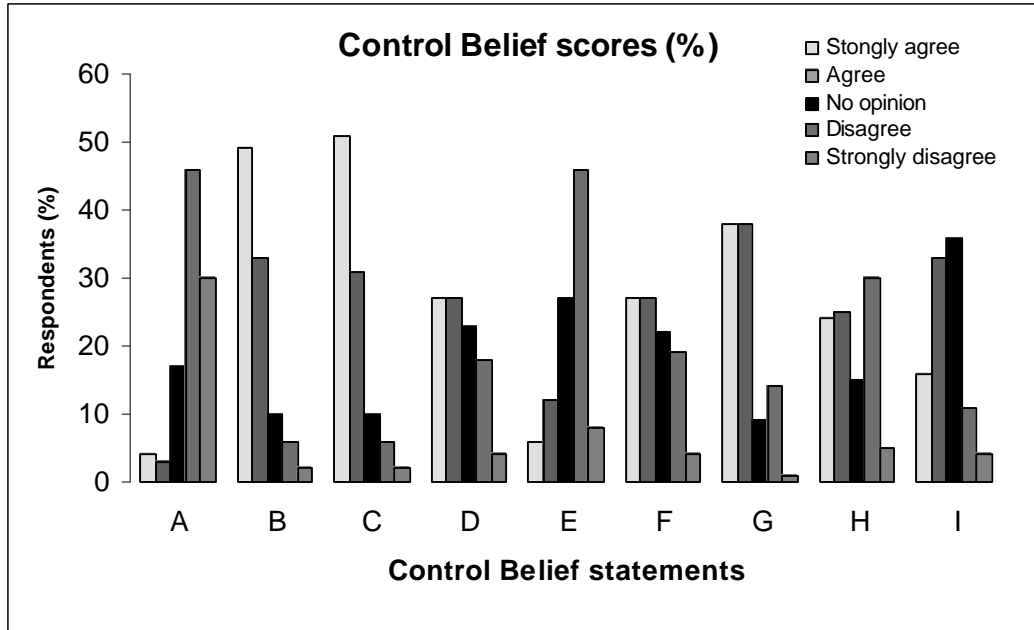
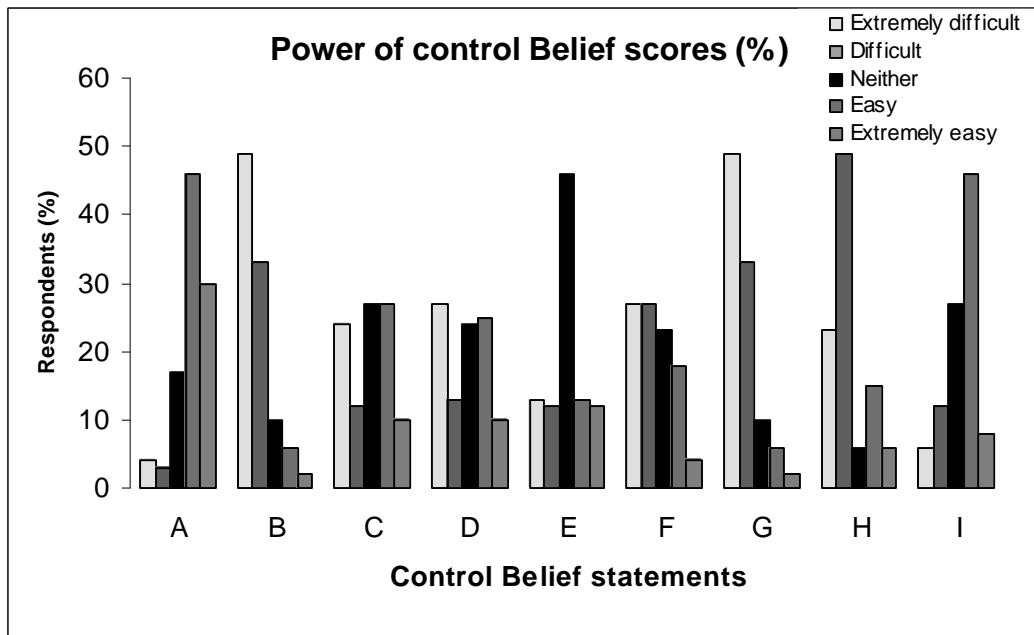


Figure 5: Control belief scores of the farmers (n=124) regarding farm forestry.



Belief statements

A= Availability of barren land	B= Unavailability of market	C= Long-term business (return)
D= No awareness	E= Absentee landlord	F= Long-time land utilization
G= Damage by animals and humans	H= Lack of nurseries	I= Acquisition of less income

Figure 6: Power of control belief scores of the farmers (n=124) regarding farm forestry.

LESSONS LEARNED

The paper set out to explore the beliefs underpinning farmers' attitudes and perceptions, the role of salient referents and the factors that encourage or discourage the successful performance of farm forestry. The significant differences in scores of FF and NFF for beliefs supporting attitudes suggest that the decision whether to grow trees on farmland is influenced by a farmer's perception of the benefits and losses in engaging in farm forestry. Farmers who have planted trees have assessed the economic and environmental benefits to outweigh the perceived adverse impacts of trees. Favorable attitudes toward farm forestry stem from their beliefs that planting trees will increase income, incur low costs, and meet household requirements for fuel wood and timber as well as reduce erosion on farms and provide them with a healthy environment in which to work. Therefore, policies and programs for promoting farm forestry should seek to intensify or encourage these beliefs, especially among those who have not already been engaging in farm forestry.

However, the finding that NFF as well as FF have a generally favorable attitude toward the planting of trees suggests that the other two main constructs in the TPB framework are implicated in farmers' overall beliefs about farm forestry. Our data show that the decision to grow trees on farmlands is associated with farmers' perceptions of the opinions and suggestions of salient referents and the motivation to comply with their approval and disapproval. Coupled with attitudes and perceptions farmers also feel social pressure while considering the decision to grow trees on their farms. Peer pressure is, therefore, an important factor influencing farmers toward growing trees on farm. Consequently, efforts and strategies to target social pressure from family (Khan et al. 1990), fellow farmers (Nawab and Lawrence 1995), tenants and owners (Khan 1991), and village old man, may influence and modify the existing belief system and help to build a new one that is more responsive to change and which may increase the performance of farm forestry. The importance of village old man as a salient referent indicates the role of opinion leaders, who can be instrumental in information dissemination and influencing farmers' attitudes and perceptions. Other authors have similarly identified the role of village leaders, including religious leaders, whose voice and suggestions are highly valued in different walks of life (Khan 1998).

The availability of land is reported as a major encouraging factor contributing toward the performance of farm forestry. This indicates that farmers consider trees as crops of marginal or barren land due to a number of discouraging factors (market unavailability, lack of nurseries and the long-term nature of farm forestry as an enterprise) in the performance of farm forestry. The competition between farm forestry and agriculture assumes importance if both compete for the same land: if good agricultural land was put under farm forestry, then obviously crop production would be adversely affected (Sharma et al. 1995). This suggests a need to concentrate more on short-rotation multipurpose tree species rather than long-rotation tree species especially when availability of productive land is a constraint and farming is more directed toward subsistence level. Similarly Salam et al. (2000) reported that "devising more systematic tree designs and careful

species selection may therefore reduce the perception of tree growing as long term business by taking farmland for tree planting as utilized for the agricultural purposes.”

The market for tree products is an important factor to consider. Unavailability of markets and lack of information regarding available markets is a serious constraint that hampers farmers’ profit and leads to a high share of the profit being diverted toward intermediaries. There is a need to communicate market information clearly to farmers so that they can plan and implement tree-growing strategies. A platform is needed at district level for tree growers (FAO 1987) and also for wood contractors, industrialists, and consumers to streamline the affairs of production and marketing of fuel wood and timber. Moreover supporting wood price as is done for agricultural commodities² may also help to encourage tree growing on farmlands.

There is no network of nurseries and Forest Department nurseries are not easily accessible to most of the areas situated away from the city or metalled roads where nurseries are established. Nurseries run by private owners have a limited choice of planting stock. Farmers do not have their own nurseries to generate planting stock and hence they have to rely on nurseries operated by the Forest Department and private owners. The accepted wisdom in social forestry circles is that seedlings are never in such a short supply as to pose a constraint to tree cultivation, but Pakistan’s plains appear to present an exceptional case (Dove 1995b). The issue of lack of nurseries coupled with poor access is a major constraint in the performance of farm forestry. A village-level network of nurseries maintained and run by the farmers under Forest Department supervision may generate confidence among farmers and infuse encouragement to opt for tree planting on farmlands. This may also provide an impetus to allow more and more nurseries to flourish in the future and ultimately lead to an increase in the number of trees on farmlands that will contribute toward improved rural livelihood through the sustainable supply of fuel wood, timber, and other tree products. Another important factor that discourages tree planting on farmlands is the damage to seedlings by animals and humans. This perception points to the need to sort out ways and measures to prevent damage from animals, as well as to combat the human factor in damaging trees. This requires rigorous efforts in awareness raising, training, and demonstration campaigns showing the importance of trees and highlighting ways to protect young trees from hazards.

CONCLUSION

The research reported here suggests that unless problems related to marketing, lack of nurseries, the perception of farm forestry as a long-term business, and damage to seedlings by animals and humans are tackled, policy interventions to increase tree growing on farmlands as part of farmers’ livelihood strategies will be of questionable value. This paper has underlined the importance of cognitive (beliefs) and social-psychological (social norms) factors in distinguishing farmers who have decided to plant trees on their farmland and those who have not. It has also demonstrated that TPB offers a structured framework and replicable methodology for identifying salient beliefs about

outcomes, social referents and control factors. The methodology produces results that can serve as guidelines for the development of more effective interventions to promote farm forestry that take farmers' perceptions and needs fully into account.

Endnotes

¹ Not all the referents mentioned by the respondents whose approval and disapproval they think matters in the decision to grow trees on farmlands were considered salient in this study. Only those referents who were frequently mentioned by respondents in open interviews were included in the measurement of the subjective norm (Fishbein and Ajzen 1975; Ajzen and Fishbein 1980).

² Government fixes the price of various agricultural commodities every year to protect the farmers from the fluctuation of market forces and to allow them to obtain a fair price for their produce.

REFERENCES

- Ahmed, J., and F. Mahmood. 1998. Changing perspectives on forest policy: Policy that works for forests and people. London, UK: International Institute for Environment and Development.
- Ajzen, I. 1988. *Attitude, personality and behaviour*. Milton Keynes: Open University Press.
- Ajzen, I. 1991. The theory of planned behaviour. *Organizational Behaviour and Human Decision Process* 50:179-211.
- Ajzen, I. 2001. Nature and operation of attitudes. *Annual Review of Psychology* 52:27-58.
- Ajzen, I., and M. Fishbein. 1980. *Understanding attitudes and predicting social behaviour*. Englewood Cliffs, NJ: Prentice Hall.
- Akbar, G., M. B. Baig, and M. Asif. 2000. Social aspects in launching projects in developing countries. *Science Vision* 5:52-58.
- Amacher, G. S., W. F. Hyde, and M. Rafiq. 1993. Local adoption of new forestry technologies: An example from Pakistan's North West Province. *World Development* 21:445-453.
- Arnold, M., and P. Dewees. 1998. Rethinking approaches to tree management by farmers. *Natural Resource Perspectives* 26. London: Overseas Development Institute.
- Beedell, J., and T. Rehman. 2000. Using social-psychology models to understand farmers' conservation behaviour. *Journal of Rural Studies* 16:117-127.

- Bukhari, A. S. 1997. The role of NGOs in promoting fuel wood production in Pakistan. In: National workshop on woodfuel production and marketing in Pakistan. RWEDP Report no.49. Faisalabad, Pakistan: FAO Regional Wood Energy Development Programme in Asia (GCP/RAS/154/NET).
- Carr, S., and J. Tait. 1991. Differences in the attitudes of farmers and conservationists and their implications. *Journal of Environmental Management* 32:281-294.
- Daigle, J. J., D. Hrubes, and I. Ajzen. 2002. A comparative study of beliefs, attitudes, and values among hunters, wildlife viewers, and other outdoor recreationists. *Human Dimensions of Wildlife* 7:1-19.
- Dove, M. R. 2003. Bitter shade: throwing light on politics and ecology in contemporary Pakistan. *Human Organization* 62(3):229-241.
- Dove, M. R. 1995a. The human-ecological background of farm forestry development in Pakistan. In *Farm forestry in South Asia*, eds. Saxena, N. C., and V. Ballabh. London: Sage Publications.
- Dove, M. R. 1995b. The shift of tree cover from forests to farms in Pakistan: A long and broad view. In *Tree management in farmer strategies: Responses to agricultural intensification*, eds. Arnold, J.E.M., and P. A. Dewees. Oxford: Oxford University Press.
- ERNP. 1999. Strategy for natural resource management. Environmental rehabilitation in N.W.F.P and Punjab. Islamabad/Brussels: Government of Pakistan/European Union.
- ESCAP. 1996. Rural poverty alleviation and sustainable development in Asia and the Pacific. New York, NY: Economic and Social Committee for Asia and the Pacific, United Nations.
- FAO 1987. Forestry Extension Organization. Rome: Food and Agriculture Organization (FAO).
- Fishbein, M., and I. Ajzen. 1975. Belief, attitude, intention, and behaviour: An introduction to theory and research. Reading, MA: Addison-Wesley.
- Garforth, C., T. Rehman, K. McKemey, R. B. Tranter, R. J. Cooke, C. M. Yates, J. R. Park, and P. T. Doward. 2004. Improving the design of knowledge transfer strategies by understanding farmer attitudes and behaviour. *Journal of Farm Management* 12:17-32.
- GOP. 2003. Economic survey of Pakistan, 2002-2003. Islamabad: Government of Pakistan (GOP).

- Heong, K. L., and M. M. Escalada. 1999. Quantifying rice farmers' pest management decisions: Beliefs and subjective norms in stem borer control. *Crop Protection* 18:15-322.
- Hosein, M. 1991. Rapid appraisal for women in the North West frontier of Pakistan. *RRA Notes* 12:21-31.
- Khan, A., G. Morgan, and A. J. Sofranko. 1990. Farmers' utilization of information sources: A study of the farmers in N.W.F.P. *Journal of Rural Development and Administration* 22:38-58.
- Khan, F. S. 1991. Contribution of agroforestry towards socio-economic development in Charsadda District, N.W.F.P, Pakistan. *Pakistan Journal of Forestry* 41:207-217.
- Khan, N. 1998. Improving the potential for adoption of agricultural technology through enhanced use of mass media and the religious community in disadvantaged environments in Pakistan. Ph.D. Thesis. Reading, UK: The University of Reading.
- Khan, N. A. 2001. Social forestry versus social reality: patronage and community-based forestry in Bangladesh. Gatekeeper Series no. 99. London: International Institute of Environment and Development.
- Khan, S. A. 1989. Channels of communication in the diffusion of farm forestry in Pakistan. M.S. thesis. Columbia, MO: University of Missouri-Columbia.
- Leach, G. 1993. Farm trees and wood markets. Pakistan Household Energy Strategy Study (HESS). Prepared for the Government of Pakistan (Energy Wing) under United Nations Development Programme (Pak/88/036) by energy Sector Management Assistance Programme.
- Likert, R. 1931. *A technique for the measurement of attitudes*. Archives of Psychology. New York, NY: Columbia University Press.
- Malik, W. H. 1989. Social dimensions in agroforestry. *Progressive Farming* 9:51-55.
- Malla, Y. B. 2000. Farmers' tree management strategies in a changing rural economy, and factors influencing decisions on tree growing in Nepal. *International Tree Crop Journal* 10:247-266.
- Mcketta, C. W. 1990. The wood shortage in Pakistan: hypothetical contradictions. *The Pakistan Journal of Forestry* 40:266-273.
- Nawab, K., and L. D. Lawrence. 1994. Communication linkages among researchers, extension personnel and farmers of Pakistan. *Journal of Extension Systems* 10(2):36-46.

- Rogers, E. M. 1995. *Diffusion of innovations*. 4th ed. New York, NY: The Free Press.
- Salam, M. A., T. Noguchi, and M. Koike. 2000. Understanding why farmers plant trees in the homestead agroforestry in Bangladesh. *Agroforestry Systems* 50:77-93.
- Sharma, K., V. Ballabh, and A. Pandey. 1995. An analysis of farm forestry in Gujarat. In *Farm forestry in South Asia*, eds., Saxena, N. C., and V. Ballabh. London: Sage Publications.
- Sheikh, M. I. 1987. Agroforestry in Pakistan. In *Agroforestry for rural needs*, eds., Khosla, P. K., and D. K. Khurana, vol. 1. Solan, Indian Society of Tree Scientists.
- Siddiqui, K. M. 1997. Woodfuel in the national energy balance. In *National Workshop on woodfuel production and marketing in Pakistan*. RWEDP Report no.49. Faisalabad, Pakistan: FAO Regional Wood Energy Development Programme in Asia (GCP/RAS/154/NET).
- Stubenitsky, K., and D. J. Mela. 2000. UK consumer perceptions of starchy foods. *British Journal of Nutrition* 83:277-285.
- Zubair, M. 2002. An application of theory of planned behaviour and logistic regression models to understand farm level tree planting and its determinants in the district of Dera Ismail Khan of Pakistan's North West Frontier Province. Unpublished PhD thesis. Reading, UK: The University of Reading.