

7 Findings regarding Wood lot management

7.1 Introduction

Wood lot planting and management was one of the behaviours studied in the initial survey carried out 1998. The response to this behaviour was then reassessed after a deliberate extension intervention 'focusing' on specific cognitive barriers to wood lot management identified in the first survey. The assessment or second survey was conducted in the last quarter of 2001. The objective group of this deliberate intervention was rural Dagbani speaking women in the Northern Region of Ghana.

A random cluster sampling process was applied across seven communities to acquire the second sample of 270. One of the communities was known not to have been involved in the intervening 'focused' extension programme conducted between January and September 2001. The sample (28 respondents) taken from the community not exposed to the deliberate extension intervention was used as a control noted in the following report as those 'without' extension as opposed to those 'with' extension.

The following report presents the finds regarding the impact of the 'focused' extension intervention that addressed the previously identified cognitive barriers to wood lot management and tree planting. Regarding wood lot planting and care, the first survey findings can be expressed as follows:

The practice of wood lot planting and management was found to be strongly negative. However, a positive intention to plant trees in wood lots was expressed. Few influential 'barriers' were identified when the first sample is taken as a whole. One of the most interesting findings was that the women appeared to have overcome some of the traditional taboos to planting trees.

The key barriers identified applied specifically to the 'displaced'²¹:

- Concern regarding social and practical support
- The practical problems of theft, animal damage and drought.
- Security of future utility

It was suggested that future extension, in the light of the positive attitude to planting wood lots, should aim at accompanying practice and consolidating the learning process, i.e. the use of 'field demonstrations'.

Channels identified that need to be used to encouraging wood lots planting are:

- The Chief, especially in rural contexts and particularly in stable communities.
- The family unit needs to be the focus, especially for non-displaced
- groups and communities developing ideas and working together

In the analysis of the second survey, three separate comparative groups have been assessed to explore the 'focused' extension impact. A sample from the first 1998 survey of rural Dagbani speaking women is compared with the second survey sample, i.e. 'Before and After'. The change that has occurred naturally over the three year time period between the first and second surveys, i.e. in the absence of the external intervention, can also be identified by comparing the first survey sample with those not exposed to extension. The main impact of the extension is observed by comparing those 'With and Without extension', the second comparative group. Those who have 'Attended or have Not Attended' wood lot management demonstrations form the third comparative group.

The comparisons of the differences in response to the main TORA variables and sub-variables between these groups are presented in Tables 7 to 10 and Figures 14 to 19 and discussed within the following sections of this report. Non parametric statistical tests have been applied to explore the differences, i.e.

²¹ The first survey sample was drawn from both displaced and stable populations as well as rural and urban dwellers from a variety of language groups in north Eastern Ghana.

the Mann Whitney U Test. Spearman Correlations have been used to identify the strength of association between the different TORA variables and thus identify changes that have occurred in the subjects' cognitive response to wood lot management.

7.2 Changes in the main TORA variables (impact of focused extension)

As in the case of the adoption of improved stoves and firewood collection, the same questionnaire was applied in the second survey as in the first. When the reliability of the different scales applied to the management of wood lots were tested, all were found to have acceptable alpha coefficients, i.e. α of >0.6 .

The only to principal TORA variables that demonstrated a significant change due to the influence of the 'focused' extension programme are overall wood lot management behaviour ($p = 0.000$) and the stated intent to undertake wood lot planting and care in the next year ($p = 0.033$) (Table 7). In both instances the change is positive. The other variable to register a significant positive change was the product sum measure of the subjective norm ($p = 0.050$). In this instance those who had attended as opposed to those who had not attended wood lot demonstrations registered the significant 'positive' normative change. Those who had attended demonstrations also registered a similar significant positive change regarding behaviour and stated intent (Table 7).

When the sample from the first survey is compared with those who had not been involved in the focused extension programme it was noted that all the scores registered against the main variables had weakened, i.e. become less positive toward wood lot planting and management²². This indicated that the natural trend over the past three years within the region has been negative regarding wood lots (Table 7). It is therefore claimed that the 'focused extension intervention has led to a reversal in this general negative trend.

It appears that the ownership of land and cattle has a positive influence on the attendance of demonstrations. The consumption rate of firewood is the only other descriptive variable that appears to influence attendance, the more efficient the fuel wood use the more likely they are to have attended.

7.3 Changes in the planting and management of wood lots

In the case of those exposed to the extension programme wood lot management behaviour has improved significantly, although the mean score is still negative (-2.10 on a -10 to +10 range). Those attending demonstrations registered a slightly more positive change (-0.99) (Table 8).

The wood lot management behaviour is measured by taking the sum of ten related sub practices. Those exposed to the 'focused' education programme have registered significant positive change with regarding 7 of these sub practices.

In case of wood lot management behaviour it appears that exposure to the 'focused' extension initiative as led to significantly more positive management behaviour, particularly with regard to tree planting, wood lot management, participation with others in the process and setting aside land for wood lots. Although those that had been exposed to the extension programme indicated a strong positive change in general wood lot management, there was little change regarding the watering of saplings or the building of protective fences. Similarly, although there has been a significant increase in the incidence of women 'participating' in planting trees, the change in women planting on their own, though positive, was not significant and still remains strongly negative (-0.62 in a range of - 1.00 to +1.00) (Table 8). Women still appear hesitant to plant on their own even though those who had attended demonstrations registered a significant positive change.

²² The only variable that contradicts this trend is the expressed probability that they will be involved in wood lot management. However, the expressed probability in this study is not regarded as one of the principal TORA variables.

Table 7: Comparison of Changes in Wood Lot TORA variables due to Extension Interventions applying the Mann-Whitney U Test

| Wood Lot management TORA Variables | First and Second Survey Comparison | | | Involvement in Extension Programme | | | Attendance of Extension Demos | | |
|--|---------------------------------------|---------------------------|--------------|--|--------------------------------------|--------------|-----------------------------------|-----------------------------|--------------|
| | First N = 62 Mean | Second N = 230 Mean | MW Sig. | Without Extension N = 28 Mean | With Extension N = 202 Mean | MW Sig. | Not Attended N = 62 Mean | Attended N = 168 Mean | MW Sig. |
| Wood lot planting behaviour index Range (-10 to +10) | -6.807 | -2.73 | 0.000 | -7.29 | -2.10 | 0.000 | -7.44 | -0.99 | 0.000 |
| Wood lot planting intention Range (-2 to +2) | 0.840 | 0.99 | | 0.64 | 1.04 | 0.033 | 0.60 | 1.14 | 0.003 |
| Wood lot planting probability Range (-2 to +2) | 0.790 | 0.95 | | 0.93 | 0.96 | | 0.74 | 1.03 | |
| Attitude to wood lot planting (Statement) Range (-2 to +2) | 1.630 | 1.50 | 0.050 | 1.36 | 1.51 | | 1.42 | 1.52 | |
| Wood lot planting (sum) of attitude $\sum b_i * e_i$ Range (-80 to +80) | 20.613 | 16.00 | 0.005 | 17.57 | 15.79 | | 16.94 | 15.66 | |
| Wood lot planting subjective norm (Statement) Range (-2 to +2) | 1.060 | 1.21 | | 0.96 | 1.24 | | 1.31 | 1.17 | |
| Wood lot planting subjective norm (sum) $\sum m_j * b_j$ Range (-24 to +24) | 11.903 | 10.53 | 0.020 | 9.46 | 10.68 | | 11.71 | 10.10 | 0.050 |

Table 8: Comparison of Changes in Wood lot Management Behaviour due to Extension Interventions applying the Mann-Whitney U Test

| Wood Lot Management Behaviour | First and Second Survey Comparison | | | Involvement in Extension Programme | | | Attendance of Extension Demos | | |
|---|------------------------------------|---------------------------|--------------|--|--------------------------------------|--------------|-----------------------------------|-----------------------------|--------------|
| | First N = 62 Mean | Second N = 230 Mean | MW Sig. | Without Extension N = 28 Mean | With Extension N = 202 Mean | MW Sig. | Not Attended N = 62 Mean | Attended N = 168 Mean | MW Sig. |
| Planted trees | -0.680 | -0.170 | 0.000 | -0.79 | -0.09 | 0.000 | -0.77 | 0.05 | 0.000 |
| Planted for firewood only | -0.900 | -0.370 | 0.000 | -0.79 | -0.31 | 0.011 | -0.84 | -0.19 | 0.000 |
| Wood lot management | -0.610 | 0.030 | 0.000 | -0.57 | 0.11 | 0.001 | -0.68 | 0.29 | 0.000 |
| Attended meeting and demos | -0.350 | 0.420 | 0.000 | -0.57 | 0.55 | 0.000 | -0.48 | 0.75 | 0.000 |
| Watered saplings | -0.680 | -0.630 | | -0.79 | -0.60 | | -0.87 | -0.54 | 0.004 |
| Encouraged others to plant | -0.610 | -0.180 | 0.002 | -0.64 | -0.12 | 0.008 | -0.65 | -0.01 | 0.000 |
| Built protective fences | -0.740 | -0.730 | | -0.79 | -0.72 | | -0.90 | -0.67 | 0.020 |
| Set aside land for trees | -0.650 | -0.280 | 0.006 | -0.71 | -0.22 | 0.011 | -0.58 | -0.17 | 0.004 |
| Women have participated in planting | -0.650 | -0.170 | 0.001 | -0.79 | -0.08 | 0.000 | -0.77 | 0.06 | 0.000 |
| Women planting trees on their own | -0.940 | -0.650 | 0.008 | -0.86 | -0.62 | | -0.89 | -0.57 | 0.005 |
| Wood lot management behaviour index Range (-10 to +10) | -6.807 | -2.730 | 0.000 | -7.29 | -2.10 | 0.000 | -7.44 | -0.99 | 0.000 |

Practical demonstrations have reinforced the extension messages and led to an overall more positive response to wood lot management, i.e. a significant positive change was noted regarding all the sub behaviours (Table 8). This demonstrates the importance of field exercises and exposing the communities to practice of wood lot management. Demonstrations appear to have been particularly effective in promoting tree planting and their care and applies across all the main TORA variables considered, e.g. intention. This added positive impact of demonstrations was not as noted with regard to the two other behavioural categories addressed in this research, improved stove adoption and firewood collection.

Table 9: Wood Lot Management: Attitude change comparisons (Mann Whitney U Test)

| Wood lot management Attitudes | First survey N = 62 mean | Second survey N = 230 Mean | MW Sig. | Without Ext N = 28 mean | With Ext N = 202 mean | MW Sig. | Demos No N = 62 mean | Demos Yes N = 168 mean | MW Sig. |
|--|--------------------------------|----------------------------------|--------------|----------------------------------|--------------------------------|--------------|-------------------------------|---------------------------------|------------|
| Women will be able to get land WPAT1 | 2.484 | 2.491 | | 2.07 | 2.55 | | 2.45 | 2.51 | |
| Women cannot plant trees alone WPAT2 | -0.694 | -1.187 | | -0.64 | -1.26 | | -1.27 | -1.15 | |
| W' plant fruit trees they could be infertile WPAT4 | 0.339 | 0.591 | | 0.75 | 0.57 | | 0.85 | 0.49 | |
| Men will support Ws' tree planting WPAT6 | 2.839 | 2.787 | | 2.93 | 2.77 | | 2.98 | 2.71 | |
| Their fate is tied to the life of the tree WPAT7 | 0.161 | -1.091 | 0.000 | -0.71 | -1.14 | | -0.74 | -1.22 | |
| Evil if one sits in the shade of their tree WPAT8 | -0.516 | -0.991 | | -0.68 | -1.03 | | -1.02 | -0.98 | |
| Trees belong to those who plant them WPAT12 | 2.790 | 1.887 | 0.000 | 1.82 | 1.90 | | 1.92 | 1.88 | |
| Tree ownership is no longer respected WPAT13 | -0.903 | -0.365 | 0.025 | 0.18 | -0.44 | | 0.00 | -0.50 | |
| Communal trees will belong to the chief WPAT14 | -1.371 | -1.696 | | -1.07 | -1.78 | 0.041 | -1.98 | -1.59 | |
| Animals will destroy saplings WPAT15 | 1.065 | 0.030 | 0.001 | 1.32 | -0.15 | 0.001 | 0.19 | -0.03 | |
| People will steal from communal trees WPAT16 | 0.226 | -0.865 | 0.001 | -0.11 | -0.97 | 0.024 | -1.26 | -0.72 | |
| Planted trees will be used for construction WPAT17 | 1.323 | 1.283 | | 0.89 | 1.34 | | 1.23 | 1.30 | |
| People will care for communal trees WPAT18 | 2.419 | 2.387 | | 2.14 | 2.42 | | 2.52 | 2.34 | |
| Planting communally will provide for our children WPAT19 | 2.613 | 2.496 | | 2.39 | 2.51 | | 2.52 | 2.49 | |
| Not possible to plant crops and trees together WPAT21 | -0.742 | -0.700 | | -1.21 | -0.63 | | -1.15 | -0.54 | |
| Mango is only local tree people will plant WPAT24 | 1.307 | 1.326 | | 1.21 | 1.34 | | 1.60 | 1.23 | |
| We will only plant imported trees WPAT25 | 1.290 | 1.487 | | 0.86 | 1.57 | 0.004 | 1.55 | 1.46 | |
| Will plant if supplied with saplings WPAT28 | 2.823 | 3.165 | | 2.57 | 3.25 | 0.004 | 3.24 | 3.14 | |
| Saplings will die if not watered regularly WPAT29 | 0.903 | 0.896 | | 1.50 | 0.81 | | 1.23 | 0.77 | |
| People will be prepared to water saplings WPAT30 | 2.258 | 2.074 | | 1.36 | 2.17 | 0.007 | 2.08 | 2.07 | |
| Wood lot planting (sum) of attitude $\sum b_i * e_i$ | 20.613 | 16.005 | 0.005 | 17.57 | 15.79 | | 16.94 | 15.66 | |

7.4 Changes in the stated intention to participate in wood lot planting.

The strength of the stated intention of the first survey sample to plant wood lots was positive but not very positive (mean 0.84 on a possible range of -2.00 to +2.00) (Table 7). The general tendency was for the stated intent to manage wood lots to weaken over the following three years; e.g. those not exposed to the focused education programme registered a mean score of (0.64).

As a result of the extension programme, the mean score of the intention to plant wood lots increased to (1.04) and (1.14) in the case of those who had attended demonstrations, both significant positive changes (Table 7).

Figure 14: Wood Lot Planting (Before) First Survey: n=62

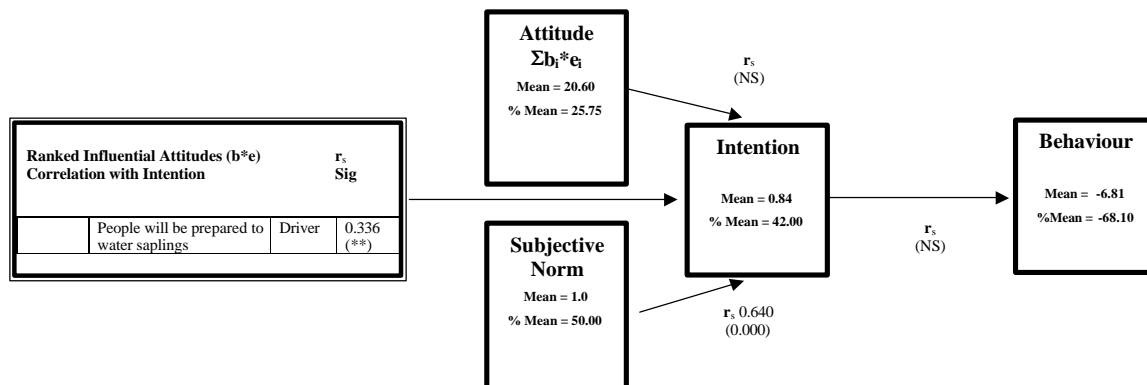
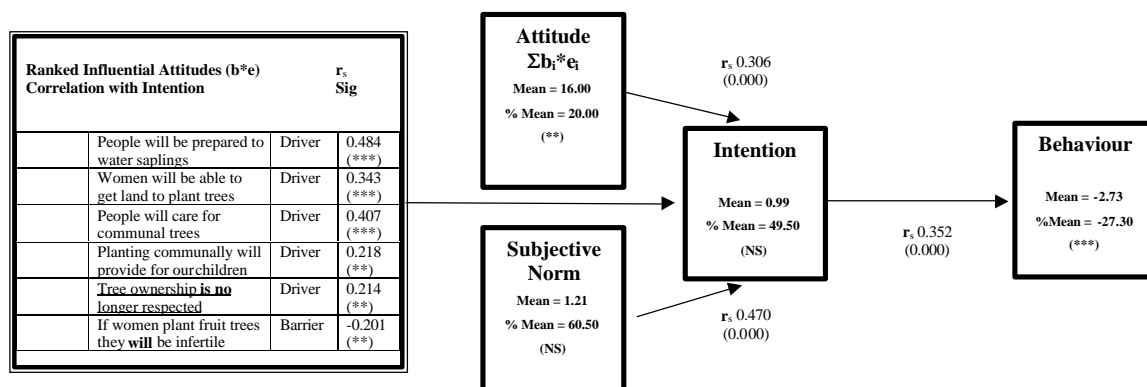


Figure 15: Wood Lot Planting (After): Second Survey: n=230



r_s Spearman Rank Order Correlation.
 Degree of significance (*p < 0.05; **p < 0.01, ***p < 0.001)

Figure 16: Wood Lot Planting ‘Without’ Extension Intervention: n=28

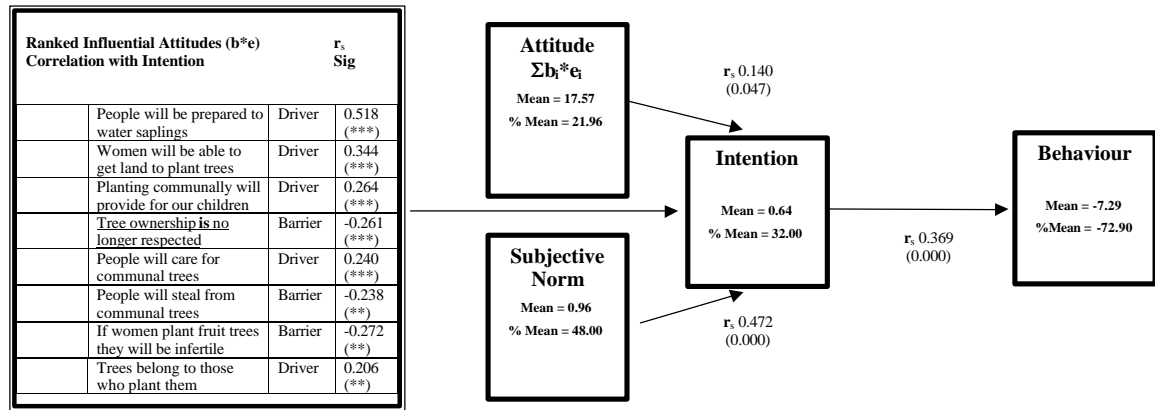
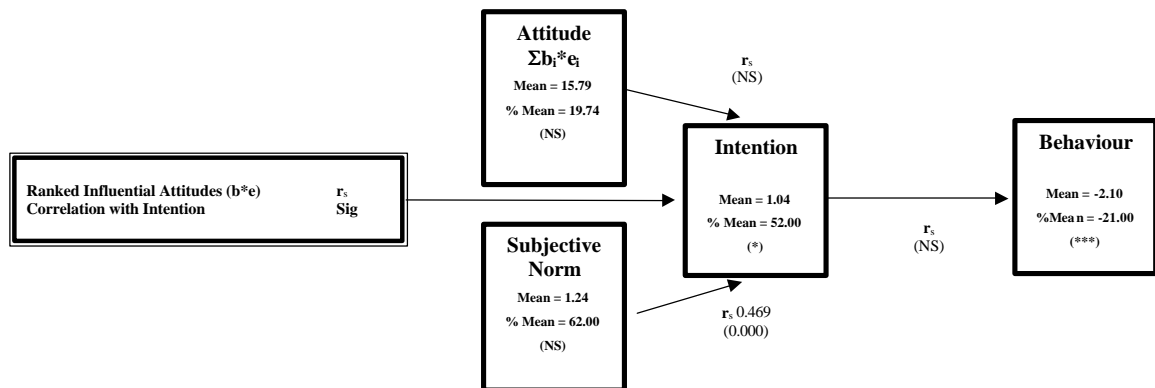


Figure 17: Wood Lot Planting ‘With’ Extension Intervention: n=202



r_s Spearman Rank Order Correlation.
 Degree of significance (*p< 0.05; **p <0.01, ***p<0.001)

Figure 18: Wood Lot Planting: 'Not' Attended Stove Demonstrations: n=62

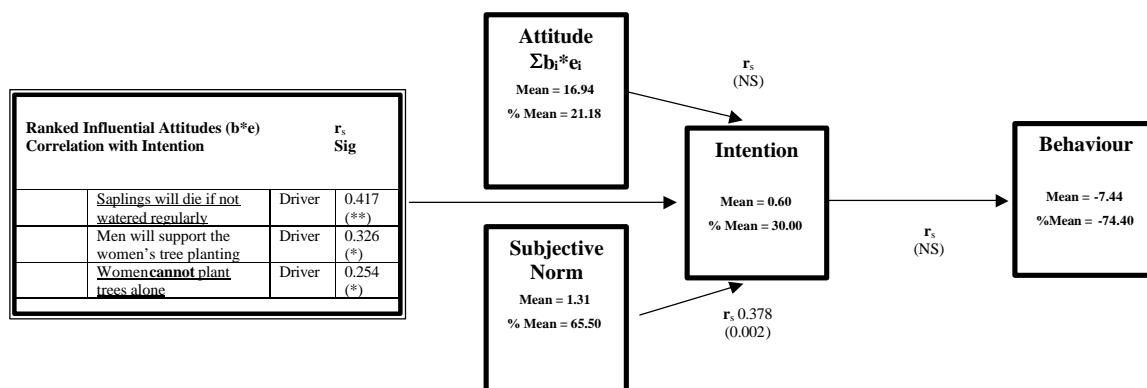
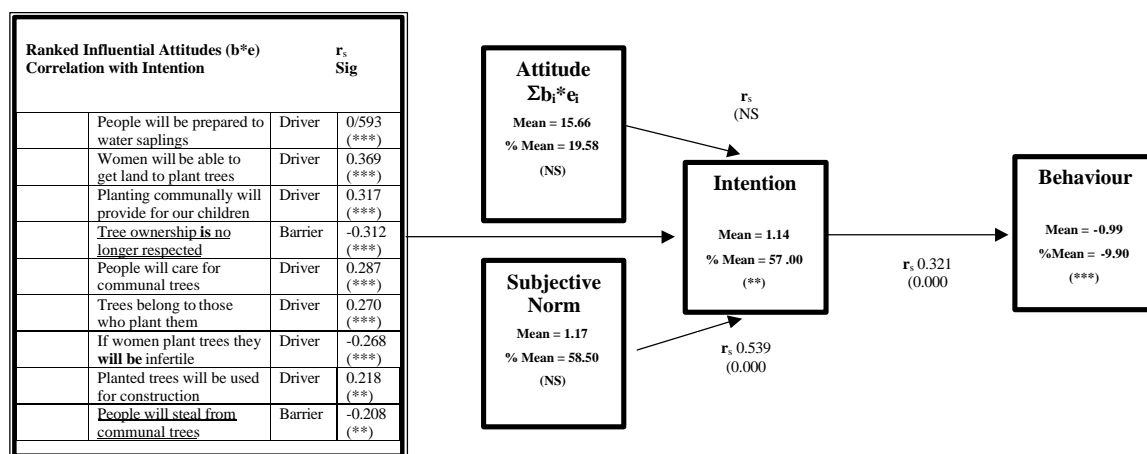


Figure 19: Wood Lot Planting: Attended Stove Demonstrations: n=168



r_s Spearman Rank Order Correlation.
Degree of significance (*p < 0.05; **p < 0.01, ***p < 0.001)

Within the TORA 'intention' is the principal indicator of future possible change if it is supported by corresponding strengthens of expressed attitude or perceived normative pressure. However, the authors claim that a lack of correlation between the measure of current behaviour and the stated intent indicate dissonance regarding current behaviour and therefore the potential for further change²³. In the case of those who have been exposed to the 'focused' extension programme, there is no significant correlation between the expressed intention and the measure of current behaviour (Figures 17) in contrast to those who were not exposed (Figure 16). This indicates a potential for further change by those who have been exposed. However, in the case of those who attended demonstrations a significant correlation exists between intent and behaviour (Figure 19). Given the more positive behaviour of this group in comparison to those exposed to extension and the similar strengthens of expressed intent of these two groups, it is suggested that there may be less potential for future change with those who have attended demonstrations. I.e. they are already responding to their expressed level of intent.

Therefore those exposed to the 'focused extension programme will probably strengthen their wood lot management behaviour further. In this case of those who have attended field demonstrations, their level of intent and current behaviour suggests that the current positive change achieved in wood lot management will be maintained for near future.

7.5 Attitude to wood lot planting and management

There has been a marked decrease in the positive attitude expressed toward wood lot management over the period separating the first and second surveys, Table 7, 9 and Figures 14 and 16. In the case of wood lot management the product sum of the outcome statements ($\sum b_i * e_i$) is taken as the measure of attitude. However, as demonstrated in Table 7 the general attitude statement measure demonstrates a similar negative general trend.

Although no significant change is noted between the attitude expressed by those exposed as opposed to those not exposed to extension intervention, those exposed demonstrate a slightly more negative attitude as do those who have attended demonstrations (Table 7 and 9).

When the relationship between attitude and expressed intent is observed, those who have not been exposed to extension and who have not attended demonstrations demonstrate significant correlations between attitude and intent (Figures 16 and 18). No significant attitude vs. intent correlation is noted by neither those exposed to the extension programme nor those who have attended demonstrations (Figures 17 and 19). This suggests that after exposure to education on wood lot management the attitude component does not appear to support the more positive statement of intent to manage wood lots. This indicates that there are still barriers to the adoption of improved fuel wood and / or that the positive change in both intention and behaviour achieved by the extension programme were more influenced by a perception of increased social pressure to adopt wood lot management behaviour. This is found to be the case and is demonstrated by the stronger significant subjective norm vs. intention correlations registered by both those exposed to extension and who attended demonstrations (Figures 17 and 19).

7.6 Changes in the influence of the Subjective Norm on wood lot planting

The measure of the subjective norm that has been applied to this analysis is the general statement of the subject's perception of the wishes of those most important to her regarding the adoption of wood lot management. As indicated earlier there are no significant changes resulting from either the extension intervention or the attendance of demonstrations. However, in the instance of exposure to the extension programme the subjective norm has strengthened in support of wood lot management. The opposite has occurred in the case of those who have attended demonstrations, although it has only weakened slightly. In this instance it is interesting to note that the subjective norm of those who claimed not to have attended demonstrations is stronger than all the other comparative groups measured (1.31 range - 2.00 to +2.00). The same tendency is reflected in the product sum measure of the subjective norm ($\sum m_j * b_j$) demonstrated in Table 7, however, in this instance the difference is significant ($p = 0.050$).

²³ I.e. where the expressed intent is stronger than current behaviour

When the relationships between the different TORA variables across the different groups are compared, subjective norm vs. intent correlations are significant in all cases and stronger than the attitude vs. intent correlations (Figure 16 to 19).

This finding indicates that the positive changes in expressed intent and behaviour regarding wood lot management are dependent on changes in the subject's perception of appropriate normative behaviour more than changes in their attitude toward the wood lots. This was the case in the first survey sample however, with those not exposed to extension nor demonstrations the influence of attitude and subjective norm on their state intent is more balanced, although still dominated by the subjective norm.

To understand the influence of the 'focused extension intervention it important to appreciate the changes that have occurred in the normative construct. With respect to the exposure to the extension programme, a significant positive change has occurred with regard to the normative influence of both the village chief and extension agent regarding wood lot management (Table 10). The positive change regarding these two social referents is supported by significant changes in the subjects' motivation to comply and belief that the referents would approve of the practice of wood lot management. This suggests that the extension agent has had a positive influence and their respect for him/her has grown as a result of the extension programme. It also indicates that the chief has been involved in the process and is seen to be more supportive of wood lots and their involvement. In this instance the change in wood lot management behaviour would appear to be attributable to the change in the normative pressure of these two referents. This corresponds in part with the recommendations regarding appropriate channels identified through the analysis of the first survey stated earlier. However, none of the normative readings for each of the referents regarding those exposed to the extension programme correlate with this group's stated intent. In comparison, in the case of those not exposed to extension, the normative reading for friends family and radio correlate significantly with group's stated intent. This suggests that a persistence with the same extension strategies will result in a greater change in the decision to plant wood lots.

In the case of those who have attended demonstrations, the significant changes in the normative component all relate to reductions in the influence of the other four references addressed, friends, family, landlords, and radio (Table 10). The normative value attributed to the chief has not changed while that of the extension agent has increased, although not significantly. When the normative readings for those subjects who have attended wood lot demonstrations are correlated with their intention to practice this behaviour, all the referents apart from the chief and extension agent are significant. This suggests that although chief and extension agent are the most respected referents regarding wood lot management, the group's intentions do not match the normative pressure. In order to improve the intention to manage wood lots, future demonstrations will need to aim at involving families and friendship groups.

7.7 Changes in the attitude construct.

The attitude is measured by assessing the strength of agreement with and value attributed to a number of salient (modal) outcome beliefs. The product of the agreement and value measures are calculated and summed to give a product sum reading of the attitude to wood lot management (Table 9).

The influence of the extension programme has resulted in a significant change in a number of the salient outcome beliefs when compared to those who have not been exposed (Table 9). For example there is a significant positive difference regarding the belief that:

- They will be able to acquire land for wood lots
- Animals will not destroy the saplings
- People will care for communal trees
- They will plant trees other than imported ones
- They will plant if supplied with saplings
- Saplings will be able live without beings watered (manually)

When the impact of the attendance of demonstrations is observed the beliefs where significant positive change has occurred related to:

- The ability to get land for wood lots

- That their fate is no longer tied to the life of the tree (they plant)
- That trees will belong to those who plant them
- That tree ownership will be respected
- Saplings will be able live without beings watered (manually)

When these changes are compared those who have been exposed to the extension programme, the changed beliefs related to their intention to plant and care for the wood lot. However, when comparing the changes registered by those who have attended demonstrations, the issue of ownership and the rejection of the traditional taboos associated with women planting trees are prominent. The changes with this group indicate experience in wood lot planting and management, while the significant changes registered by the extension group are prepositional. Both groups expressed a stronger belief regarding access to land and the drought resistance of the saplings.

The ranking of the product scores of the outcome attitudes (b*e) are similar between those exposed to extension and those who have attended demonstrations. Regarding those exposed to the 'focused extension programme the seven most highly ranked attitude statement products are:

1. Will plant if supplied with samplings (3.25 range -4 to +4)**
2. Men will support women's tree planting (initiatives) (2.77)
3. Women will be able to get land (for wood lots) (2.55)
4. Planting communally will provide for the children (2.51)
5. People will care for communal trees (2.42)
6. People will be prepared to water saplings (2.17)**
7. Trees belong to those who plant them (1.90)

In comparison the 7 most highly ranked outcome attitudes of those not exposed to the extension programme are:

1. Men will support women's tree planting (initiatives) (2.93)
2. Will plant if supplied with samplings (2.57)
3. Planting communally will provide for the children (2.39)
4. People will care for communal trees (2.14)
5. Women will be able to get land (for wood lots) (2.07)
6. Trees belong to those who plant them (1.82)
7. Saplings will not die if watered regularly (1.50)

The above ranking comparison demonstrates the similarity in the highest scoring -either negative or positive- outcome attitudes. The only difference between those exposed as opposed to not exposed to extension in the ranking of the respective top 7 outcome attitudes is with regard to people being prepared to water the saplings (6) in the case of those exposed. In the case of those not covered by the extension programme the statement regarding the drought tolerance of the saplings is ranked (7) and not included after expose to extension.

The only outcome attitudes to register a significant (positive change) as a result of the extension programme in the 7 most highly ranked of each group are the attitude expressed toward people's willingness to water the young trees, willingness to plant if supplied with saplings (Table 9).

The other outcome attitudes to register a significant 'positive' change as a result of the extension programme relate to the rejection of the fact that their fate will be tied to the life of a tree planted by them. Also that animals will not destroy the young trees and with respect to an increased willingness to plant other than imported trees. The other outcome attitude that resulted in a significant 'negative' change after exposure to extension relates to the belief that communal trees will belong to the chief²⁴.

²⁴ Although the value attributed to this outcome was negative and they did not believe that this would be true. The product of the belief and attributed value (b*e) was negative (Table 9). If the belief sign had

This attitude suggests that those exposed to extension are more strongly opposed to the chief owning the communal trees.

7.8 *Barriers and Drivers*

The TORA suggests that the strength of correlation between the salient outcome attitudes and the expressed intent to perform the behaviour in question will identify those attitudes that have greatest influence on the decision to act. I.e. the identification of which ones are acting as 'barriers' to the decision to perform the behaviour or those that may be acting as 'drivers', supporting the decision to act. In other words this process identifies the reasoning underpinning the decision to act or not (Reasoned Action).

When the 'reasoning' supporting the expressed intent to undertake wood lot management of the comparative groups is compared, marked differences are noted. Figures 14 to 19 indicate the critical cognitive drivers and barriers (attitudes) influencing the decision process of each of these groups. In each case a significant correlation either negative or positive between the identified outcome attitude and the expressed intent.

The first survey sample (Figure 14) demonstrates no significant influence of the overall attitude ($\sum b_i * e_i$) and the expressed intent. Only one outcome attitude ($b * e$) that acted as an influential 'driver' was noted, that 'people will water saplings'. The 'reasoning frame' of those not exposed to extension but drawn from the second survey sample changes significantly. The overall attitude correlates significantly with the expressed intention, as does the subjective norm in this case. The intention is influenced by various outcome attitudes. Five of these act as drivers and three as barriers to the decision to undertake wood lot management (Figure 16). The three 'barriers' relate to the issues of future ownership of the wood lots, theft and the belief that women will become infertile if they plant fruit trees.

When the 'reasoning frame' regarding wood lot management of those exposed to 'focused' extension is considered, the lack of influence of the attitude component is notable (Figure 17). Neither the overall attitude measure nor any of the outcome attitudes appear to influence their decision to act. This finding underpins the earlier note that the positive impact of the extension process on both intention and behaviour relate to the changes in the perceived social pressure to undertake wood lot planting. The strategy of targeting the whole community in a cross sector and gender approach to natural resource management in the 'focused' extension initiative seems to have fortified the normative influence.

In the case of those who have attended demonstrations the attitude component is more influential (Figure 19). Although there is not a significant overall attitude vs. intention correlation, and the decision process is governed by normative pressure, nine of the outcome attitudes appear to influence the decision to undertake wood lot management. The majority of the outcome attitudes that demonstrate a significant positive correlation with the stated intent are considered drivers. However, two are acting as barriers, i.e. the issues of future ownership and theft. A third outcome attitude also registered a negative correlation but in this instance is treated as a driver but also could be seen as an underlying barrier, 'the loss of fertility resulting from the planting of fruit trees'²⁵. The difference in the 'reasoning frame' of those who have attended demonstrations as opposed to those who have been exposed to the 'focused' extension indicates the advantage of 'hands on exposure' to wood lot management on their reasoning regarding this practice. This finding reinforces the importance of demonstrations encouraging wood lot management amongst the Dagbani speaking women of North Eastern Ghana.

not been changed this statement's product would have produced a positive attitude toward the prospect of the chief owning the communal trees which would have been counter intuitive.

²⁵ The rejection of this statement and the negative evaluation of the outcome should produce a positive attitude product. I.e. one would expect the respondent to give this outcome a negative evaluation. Therefore if they believe this is a possible result of planting trees the attitude product would be negative and intuitively correct. In this instance the belief that this will not be the result has strengthened, although not significantly. However, the resulting attitude product, although positive, has reduced in strength (Table 9). The issue of the possible loss of fertility resulting from the planting of fruit trees should be recognised as a sensitive one and having an underlying influence on the decision process for the Dagoba women..

7.9 Summary for woodlot management

- Generally tree planting and wood lot management behaviour have weakened over the past 3 years.
- Those communities exposed to the 'focused' extension initiative and particularly those who have attended demonstrations have registered a significant positive change in both their current practice and future intentions.
- The extension intervention has reversed the general negative practice trend.
 - E.g. Significant positive change was registered regarding tree planting, wood lot management, encouraging others to plant, setting aside land for trees and the increased participation of women.
 - Women are still reluctant to plant on their own and no change was registered regarding watering or fencing. However, where demonstrations have taken place there has also been a significant positive change in these two management practices (though still weak)
- The positive change in the expressed intention to plant wood lots is based mainly on the response to perceived social pressure rather than attitudes (experience based reasoning).
- The perceived social pressure from respected referents to participate in wood lot development and management has increased in the case of extension only (not significantly).
- The overall attitude has tended to weaken even when exposed to extension and demonstrations, although not significantly.
- However, changes in the subjects' attitudes indicate that the some of previously perceived barriers have been addressed. I.e. those exposed to extension believe more strongly that:
 - They will be able to get land to plant trees
 - People will care for the wood lots
 - People will be ready to plant a wider variety of trees especially if provided with seedlings
 - Animals will not destroy the young trees
 - Seedlings will survive without watering

Those that have attended demos also believe more strongly that:

- Their fate is not bound to the trees they plant
 - Their ownership of the trees planted will be respected
- Regarding those exposed to extension (without demonstrations) none of the belief statements (attitudes) registered a significant influence on their expressed positive intention.
 - The extension agent was the only influential social referent of those exposed to the extension initiative.
 - Although, overall attitude has little apparent affect, those who had attended field demonstrations of wood lot management registered several beliefs (attitudes) which appear to 'drive' their intentions regarding wood lots, i.e.:
 - People will be prepared to water seedlings and care for communal wood lots
 - They will be able to acquire land for planting
 - Planting communally will provide for their children, and that the trees will belong to those who plant them
 - Trees will also be used for construction

However, three sub attitudes still appear to be barriers:

- Tree ownership is no longer respected and people will steal from communal trees
- Planting trees may lead to infertility for the women involved*

- With regard to those who have attended field demonstrations, the most influential social referents appear to be family, friends, radio and landlord. However in each case their normative score was significantly reduced.

7.10 Conclusion for woodlot management

The main finding is the importance of targeting / involving the subjects' important social referents via an integrated cross-gender approach to natural resource management.

Field demonstrations have proved a particularly effective extension tool regarding wood lot promotion.

Table 10: Comparison of differences between Normative variable mean scores regarding wood lot management (Mann-Whitney U Test)

| Wood lot Management Subjective Norms | First and Second Survey Comparison | | | Involvement in Extension Programme | | | Attendance of Demonstrations | | |
|---|---------------------------------------|---------------------------|--------------|--|--------------------------------------|--------------|-----------------------------------|-----------------------------|--------------|
| | First N = 62 Mean | Second N = 230 Mean | MW Sig. | Without Extension N = 28 Mean | With Extension N = 202 Mean | MW Sig. | Not Attended N = 62 Mean | Attended N = 168 Mean | MW Sig. |
| Motivation to comply with Chief | 1.580 | 1.540 | | 1.36 | 1.56 | 0.038 | 1.55 | 1.54 | |
| Motivation to comply with extension agent | 1.180 | 1.340 | | 1.11 | 1.38 | 0.008 | 1.29 | 1.36 | |
| Motivation to comply with friends | 1.020 | 0.960 | | 1.04 | 0.95 | | 1.03 | 0.93 | |
| Motivation to comply with family | 1.240 | 1.290 | | 1.25 | 1.30 | | 1.39 | 1.26 | |
| Motivation to comply with Landlords | 1.320 | 1.130 | 0.032 | 1.11 | 1.13 | | 1.26 | 1.08 | |
| Motivation to comply with radio | 0.650 | 0.750 | | 0.96 | 0.72 | | 0.87 | 0.71 | |
| Chief's agreement | 1.660 | 1.500 | 0.009 | 1.21 | 1.54 | 0.003 | 1.53 | 1.49 | |
| extension agent's agreement | 1.310 | 1.370 | | 1.11 | 1.40 | 0.007 | 1.32 | 1.38 | |
| friends' agreement | 1.100 | 0.940 | | 1.11 | 0.92 | | 1.03 | 0.91 | |
| family's agreement | 1.370 | 1.250 | | 1.43 | 1.22 | | 1.44 | 1.18 | 0.001 |
| Landlord's agreement | 1.440 | 1.120 | 0.000 | 1.21 | 1.11 | | 1.24 | 1.08 | |
| Radio's agreement | 0.660 | 0.830 | | 1.04 | 0.80 | | 0.94 | 0.79 | |
| Chief's SN 1 | 2.839 | 2.491 | | 1.71 | 2.60 | 0.002 | 2.52 | 2.48 | |
| extension agent's SN 2 | 1.903 | 2.004 | | 1.25 | 2.11 | 0.008 | 1.89 | 2.05 | |
| friends' SN 3 | 1.436 | 1.357 | | 1.39 | 1.35 | | 1.61 | 1.26 | 0.015 |
| family's SN 4 | 2.000 | 1.835 | | 2.04 | 1.81 | | 2.29 | 1.67 | 0.002 |
| Landlord's SN 5 | 2.194 | 1.609 | 0.002 | 1.82 | 1.58 | | 1.95 | 1.48 | 0.020 |
| Radio's SN 6 | 1.532 | 1.239 | | 1.25 | 1.24 | | 1.45 | 1.16 | 0.045 |
| Wood lot subjective norm (sum) $\sum m_i * b_j$ | 11.903 | 10.535 | 0.020 | 9.46 | 10.68 | | 11.71 | 10.10 | 0.050 |
| Range (-24 to +24) | | | | | | | | | |