Predisposition for Conservation Agriculture in North West Ghana

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Introduction

The Sustainable Agriculture and Natural Resource Management Collaborative Research Support Program (SANREM) Technology Networks cross-cutting research activity (CCRA) is studying innovation processes for the successful development of conservation agriculture production systems (CAPS) for smallholders. This part of our study of innovation processes focuses on farm men's and women's knowledge and perspectives (technological frames) concerning their agricultural production practices; subsequent analyses will address other agricultural sector actors and the networks that support them.

For adoption to occur, it is argued that a change in mindset is required. Farmers, limited by the conventional agriculture mind-set, cannot conceive of attaining high yields without plowing the land (Hobbs, 2007; Wall, 2007). Changing mindsets, or technological frames, involves developing a shared recognition of agro-ecological deterioration that leads to reframing and extending farming sector networks to generate alternative solutions (Röling and Jiggins, 1998; Ekboir, 2003; Buck and Scheer, 2009). It is not a matter of simply training farmers but negotiated social learning that leads to the transformation of whole sets of highly interdependent actors from conventional or risk averse farming practices to sustainable conservation agriculture. But how is this dialog to be stimulated? Where do we start?

Research Methods

The data on which the following analysis is based were collected in 2010 in farming communities near Wa, North West Province, Ghana. Two hundred farm men and 157 farm women were interviewed concerning extension agent contacts and twenty agricultural production perspectives.

Drawing on a wide range of literature investigating farmer mind-sets (Lamb et al. 2010), we constructed a set of propositions to serve as indicators applicable in a wide range of agricultural production and livelihood circumstances. Respondents were asked to indicate on a scale of 1-5 the extent to which they agreed or disagreed with each statement (a response of 5 indicated strong agreement). These measures of local technological frames were examined with respect to the following hypotheses:

1. Farmers (both men and women) who have a higher level of contact with extension agents for information and inputs will hold strong Conventional Agriculture perspectives.
2. Farmers (both men and women) who have few or no contacts with extension agents for information and inputs will hold strong Risk Averse perspectives.
3. Women farmers are more likely to hold Conservation Agriculture perspectives than men farmers, regardless of extension agent contact.

Analysis of Farmer Technological Frames

Factor analysis conducted separately for farm men and for farm women determined (multi-indicator) dimensions of local technological frames characterizing conventional and risk averse agriculture. For simplicity of interpretation, factor scores were then created through simple addition.

Examination of Tables 1 and 2 indicates that contact with extension agents has little influence over the technological perspective of farm men and women. There are only a few differences in mean scores for core technological frame measures. Farm men with one extension contact during the year are less likely to support the traditional staple-based mixed crop-livestock farming systems than those with none or several extension contacts. There are no significant differences between levels of contact with extension agents among farm men for dimensions such as farming as a capital intensive business, crop diversification, or market participation. For farm women, contact with extension agents is only statistically related to interest in farming as a cash-cropping activity. Otherwise there is no relationship with the other dimensions of farm women's technological frame: the importance of the traditional production system, local food security and technological innovation. Thus, the first two hypotheses have not been confirmed. Contact with extension agents is unrelated to either conventional or risk averse technological frames.

Table 1: Mean scores for men's technological frame dimensions by contact with extension agents

	Contact with extension agents		
	No contacts	Contact with one extension agent	Contact with more than one agent
Farming is a capital intensive business	3.60	3.66	3.44
Farming requires the interdependence of staple crops and livestock	3.38[a]	2.98[ab]	4.08[b]
Extensive diversification of crop production is important	3.29	3.48	3.23
Market participation is necessary for sustainable farming	3.12	3.13	3.38
N	106	81	13

Note: "a" and "b" signify that the associated means are statistically different at the .01 level.

Preliminary correlational analysis of the three Conservation Agriculture principles demonstrated that there was no interpretable relationship among indicators. Overall, both men and women agreed that crop rotation is a best practice and many agreed that maintaining a permanent crop cover is not necessary. The greatest degree of diversity among both men and women is over whether "tillage causes land degradation". Hypothesis 3, whether farm women or men have a greater proclivity for Conservation Agriculture, was tested in Table 3. No significant differences were found in either direction for any of the three CA principles.

Table 2: Mean scores for women's technological frame dimensions by contact with extension agents

	Contact with extension agents	
	No contacts	Contact with at least one extension agent
Farming requires growing staple crops and supporting livestock	3.22	3.49
Local food security is important	4.12	4.09
Technological innovation is important for agriculture	3.89	3.97
Farming is a cash-cropping business	3.52[a]	3.90[a]
N	128	29

Note: "a" signifies that the associated means are statistically different at the .05 level.

Table 3: Comparison of mean scores for farm men and women's agreement with CA principles

	Gender	
	Farm men	Farm women
One should maintain a permanent crop cover	2.67	2.63
Tillage causes land degradation	3.05	3.10
Rotating crops is always best practice	4.17	4.13
N	200	157

Discussion

Noting the significant disagreement among farm men and among farm women over whether "tillage causes land degradation"; we decided to explore the significance of this with respect to their technological frames. Agreement among farm men that "tillage causes land degradation" is positively correlated with the perception that farming should be based on the interdependence of staple, mixed crop-livestock systems, diversification of crop production, and the importance of market participation. However, this relationship is reversed for the view that farming is a capital intensive business. That is, a positive view of investment in modern capital intensive technologies is inversely related to the perception that "tillage causes land degradation", consistent with the Conventional Agriculture technological frame. Farm women's perspectives echo these relationships with technological innovation and cash-cropping as negatively related to the idea that tillage causes land degradation. The only positive relationship is with the belief that farming should be based on the growing of staple crops and raising livestock on the fodder. Tables 4 and 5 demonstrate that in Northwest Ghana, farm men and women are both about equally divided on the issue of whether "tillage causes land degradation". This suggests that there is a significant group of Risk Averse farm men and women who would be amenable to the ideas of Conservation Agriculture.

Table 4: Mean scores for belief that tillage causes land degradation by farm men's technological frame

	Tillage Causes Land Degradation		
	Agree	Neutral	Disagree
Farming is a capital intensive business	3.50[e]	3.52[f]	3.76[ef]
Farming requires the interdependence of staple crops and livestock	3.61[a]	3.45[b]	2.85[ab]
Extensive diversification of crop production is important	3.55[c]	3.03[e]	3.31
Market participation is necessary for sustainable farming	3.34[cd]	2.91[d]	3.03[c]
N	83	33	84

Note: "a", "b", "c", and "d" signify that the associated means are statistically different at the .01 level; "e" and "f" signify that the associated means are statistically different at the .05 level.

Table 5: Mean scores for belief that tillage causes land degradation by farm women's technological frame

	Tillage Causes Land Degradation		
	Agree	Neutral	Disagree
Farming requires growing staple crops and supporting livestock	3.63[ab]	2.84[b]	3.09[a]
Local food security is important	4.08	3.95	4.23
Technological innovation is important for agriculture	3.74[c]	3.79	4.13[c]
Farming is a cash-cropping business	3.43[d]	3.50	3.80[d]
N	66	29	62

Note: "a", "b", and "c" signify that the associated means are statistically different at the .01 level; "d" signifies that the associated means are statistically different at the .05 level.

This analysis is still preliminary and requires further investigation of other intervening factors that might better explain the relationships discovered. Nevertheless, the analysis suggests that there are opportunities at the local level to advance the dialog with respect to changing the mind-set of farmers. It also suggests that those most likely to be accepting of these new ideas need not be the traditional favourites of technology transfer specialists. Messages should be tailored to the particular clientele, but the messenger(s) must also be selected with care.

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