

Abstract

Food insecurity is one of the major problems among developing countries like Zambia. Conservation Agriculture (CA) is increasingly being promoted as one of the options for addressing this problem. Enhancing sustainable climate change adaptation is also among the reasons for the promotion of CA. In Zambia, the Conservation Agriculture Project (CAP) was implemented from the year 2007 to 2011. Little documentation has been made on perceptions of smallholder farmers of climate related changes and conservation agriculture as an adaptation strategy. There is also paucity in empirical evidence on socio-economic impacts of CA among smallholder farmers in Zambia. Using household panel data (2007-2010), focus group discussions, key informant interviews, direct observations and informal discussions, this study documents the perceptions of smallholder farmers in the CAP areas to climate related changes and to CA. Factors influencing adoption of CA and socio-economic impacts of CA are also documented.

Through their practical experiences, smallholder farmers reported perceiving shifts in the timing of seasons; increased temperatures and intra-seasonal rainfall variability; increased incidences of droughts and floods; and shortening of the rainy season. Supernatural forces were the most common cited cause of changes related to climate. Perceptions related to floods and droughts were significantly ($p < 0.05$) associated with adoption of CA. Citation of CA as a climate change adaptation strategy by smallholder farmers was low (8 %) even if more than 50 % had area under CA. This low perception could be explained by lack of explicit focus on sensitisation of farmers on CA as an adaptation. This result also suggests that there are other factors influencing adoption of CA rather than the perceptions of climate related changes.

The study also found that training in CA, previous experience in minimum tillage, membership in farmer organisations, and ownership of *chaka* hoes and of rippers increased the likelihood of adoption of CA significantly. Age, education and ownership of draft power significantly reduced the likelihood of adoption of CA. Farm size, ownership of rippers, use of herbicides and trainings in CA had a positive significant relationship with the area under CA. Qualitatively, good rapport, trust, reciprocity and altruism, monitoring and evaluations of CAP, competency of the implementing agency, incentives and donor support had a positive influence on adoption of CA. Some of the farmers' views, lack of continuity of CA projects, false promises, negative experiences with herbicide use, contradictions between farmer experiences and extension messages were reported to have negative influence on adoption of

CA. Gender was also reported to influence the adoption of CA. Women were more involved in CA basins than men. However, men were more involved in animal draft powered CA (ADP ripping) than women. Most of the village leadership was reported to have a positive influence on adoption of CA.

Farmers reported reduced need for labour during clearing of CA fields (before tillage) and during weeding where herbicides were used correctly. Labour requirement in digging of CA basins was found to be higher than in conventional hand hoe tillage in most of the years. CA increased labour requirements for weeding where herbicides were not used or improperly used. Most of the increase in labour requirements was borne by women and children. Where herbicides were correctly used, farmers reported increased labour requirements for men because they are the most involved in spraying. Women reported wanting to reduce their labour requirements for weeding but feared that the use of herbicides would increase food insecurity during hunger peak period. This was because the use of herbicides was inconsistent with the practice of mixed cropping, crop rotations and the selection of wild vegetables in the cropped land for food security.

CA adopters were better than non-CA adopters in terms of growing pulses; cash income from pulses as share of total pulses production; crop diversity; and mean number of meals with pulses eaten. There was significant ($P < 0.05$) association between CA principle of crop rotation and consumption of pulses, while no significant association was found between minimum tillage and pulses consumption. Farmers preferred growing legumes that could be eaten and/or sold to legumes grown solely for conservation purposes. Cases of women who increased their cash income from pulses because of CA practices were reported. However, most farmers complained of limited access to output markets. Reduction in food shortages during the peak hunger period (October-April) because of the early green harvest from CA fields was widely reported by farmers. Farmers also reported higher yields in CA fields than in conventional fields particularly during years with little rainfall or years with frequent intra-seasonal dry spells.