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The policy environment of conservation agriculture with trees (CAWT) in Eastern Kenya: Do small scale farmers benefit from existing policy incentives?

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Conservation agriculture with trees (CAWT) is an approach that combines conservation agriculture (CA) practices with those of agroforestry. One of the knowledge gaps that must be addressed to fully exploit the potential of CAWT pertains to policies favouring or discouraging its adoption among small scale farmers. The study hypothesized that disincentives exist more than incentives in existing policies for the promotion of CAWT among small scale farmers in Kenya. We identified policy incentives and disincentives promoting or hindering large scale adoption of CAWT among small-scale farmers in Kenya by reviewing six agricultural policies related to CAWT. In addition, 26 national level government officials and technical people were interviewed and 120 small-scale farmers were surveyed in Kibwezi and Meru Countries in Eastern Kenya. We found that policy compliance by farmers was influenced by direct personal benefits derived from adopting the policies rather than the external motivations that policy incentives provide. Furthermore, policies are often poorly implemented or not exclusively targeted to small scale farmers. Farmers believe that 'indirect enabling incentives' such as provision of improved extension services, security of land tenure and market development could offer the best motivation for them to adopt CAWT.

Key words: Conservation agriculture with trees (CAWT), incentive, disincentive, policy, small-scale farmers.

INTRODUCTION

Tillage-induced soil erosion is responsible for 40% of land degradation worldwide and it can entail soil losses exceeding 150 tonnes/hectare annually in developing countries (FAO, 2001). With up to 80% of African farmers engaged in agriculture (Garrity et al., 2010; Morris et al., 2009), majority are small scale farmers with limited capital endowment. In developing countries, increased adoption of on-farm trees within farming systems, commonly referred to as agroforestry, is one of the strategies of arresting land degradation, especially under resource-limited conditions and lower input situations (Nair, 2007), providing immediate benefits to resource-constrained small scale farmers (Jama et al., 2006).

Yet another different strategy of combating soil

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degradation is Conservation Agriculture (CA), which is gaining acceptance as an alternative to both conventional and organic agriculture as a means of ensuring sustainability (FAO, 2009). FAO describes CA as a toolkit of agricultural practices that combines, in a locally adapted sequence, the simultaneous three CA principles of reduced tillage or no-till; soil surface cover and crop rotations and/or associations (Naudin et al., 2011; FAO, 2009). Although conservation interventions aimed at reversing degradation as well as boosting agricultural productivity have gained increasing interest in Africa and the world at large, there has been a generally low adoption of CA in Africa. The total area under CA is estimated to be less than one percent of the continent's land (FAO, 2009).

One way to increase CA uptake would be by incorporation of agroforestry into CA practices. Although CA has many features in common with agroforestry (Kassam et al., 2009), combining these two sustainability practices is what results in Conservation Agriculture With Trees (CAWT). CAWT combines the three CA principles with agroforestry's principle of trees on farms, hence rather than CAWT being simply one of the many forms of agroforestry, it would add a fourth principle to the three CA principles- that of tree-crop integration (Mowo and Kiwia, 2009).

Despite the potential of CAWT in many Sub-Sahara African countries and particularly Kenya, a number of policy aspects influence the adoption of the initiative. Most agricultural policies still actively encourage farming that is relying largely, often almost exclusively, on external inputs and technologies, discriminating locally adapted technologies and practices (FAO, 2001). Institutional weakness and inappropriate policy formulation seem to be one of the key constraints to getting agriculture moving, and in that, Kenya is not so different from many other countries in Sub-Saharan Africa (GTZ Sustainet, 2006). There is still inadequate understanding of the market, policy and institutional failures that shape and structure small scale farmer incentives and investment decisions (Nair, 2007). Incentives are defined as external prompts of many forms provided by the government through policies and programmes to which farmers respond, either positively or negatively whereas disincentives refer to those that discourage, hinder or deter positive responses or actions to occur (Catacutan and Piñon, 2009).

Policy analysis is not new, albeit the approach has been more on increased policy debate in which uncertainties are recognised, complexities appreciated and the combination of views from different stakeholders sought as a central plank in planning for the future (Sanchez et al., 1997; De Jager, 2005). In terms of CAWT, few attempts have been made to analyse its policy environment or to advocate CAWT technologies in national policy processes regarding agriculture and natural resource management (Shetto and Owenya, 2007). As part of 'getting the policy right', there is a need to evaluate existing national and regional policies to determine whether they have inadvertently created direct and/or indirect incentives and/or disincentives to the adoption of soil replenishment technologies (Ajayi et al., 2007) such as CAWT, especially assessing their impacts in different local conditions (Knowler and Bradshaw, 2007).

This study used the concept of 'incentive' adopted by Enters et al. (2004) and Catacutan and Piñon (2009) (Figure 1) to understand the factors underlying CAWT adoption. The study was guided by the assumption that certain incentives are needed to stimulate wider adoption of CAWT by small scale farmers, which is presented in the schematic diagram (Figure 2). In the context of CAWT, direct incentives are those that have the potential to lower investment cost of CAWT practice for instance by lowering input costs while indirect economic incentives are those that increase returns on a farm, for example, by increasing profit margins. Indirect enabling incentives are those that influence a farmer's decision to practice CAWT. Direct incentives such as cost-sharing arrangements and indirect economic incentives such as price controls could act as enabling incentive policies with the aim of increasing adoption of CAWT. Indirect enabling incentives such as market development where output prices offer higher profit margins as compared to input prices, as well as resource security including land tenure also have the potential of motivating small scale farmers to adopt CAWT.

Aims and hypothesis

The study hypothesized that disincentives exist more than incentives for CAWT in current policies. It aimed to describe the policy environment of CAWT in the context of incentives and disincentives for small scale farmers. A scoping review of national-level policies pointed out that there was no policy specific to CAWT, hence the study focused on policies governing the agriculture, land and forestry sectors, as they were related to CAWT, with the land and agriculture sectors as basic units of crop production, and the forestry sector as being strongly related to agroforestry practices (Nair, 2007), which is a key component of CAWT. The specific objectives were to (i) identify specific policy incentives and disincentives existing for small scale farmer investment in CAWT; and (ii) assess the policy perspectives of local stakeholders in relation to CAWT. Based on Catacutan and Piñon's study (2009) on the policy context of vegetable-agroforestry system (VAF) in the Philippines, this study focused on CA practices and policy making processes in Kenya.

METHODS

A participatory policy analysis approach was applied in this study, which entailed national level policy reviews and local level data collection. At the national level, relevant policies on agriculture,

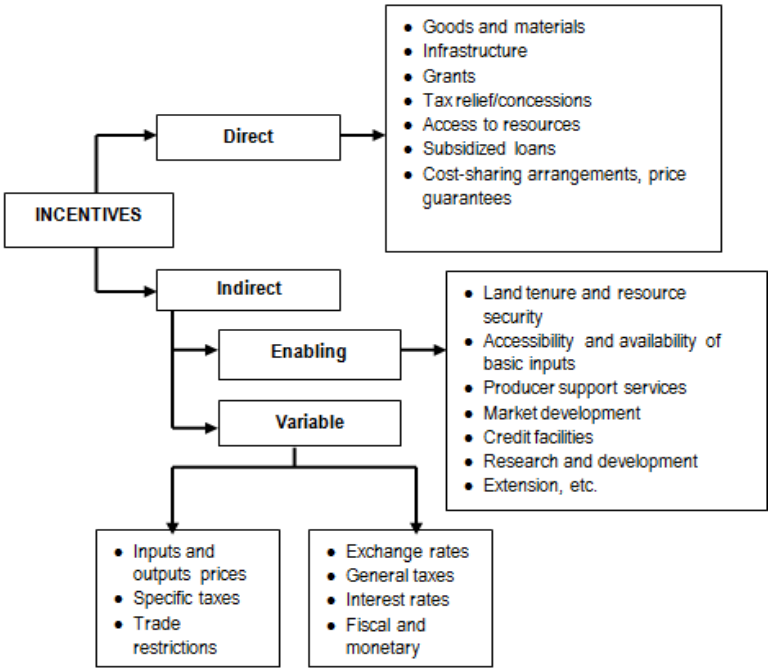

Figure 1. Types and examples of incentives (and disincentives) (Source: Enters et al., 2004; Catacutan and Piñon, 2009).

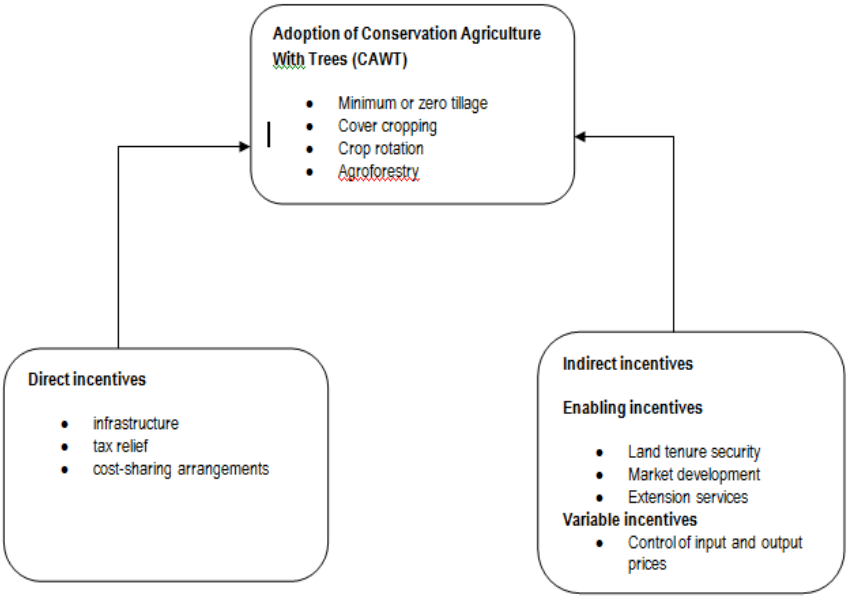

Figure 2. Schematic diagram showing incentives (direct and indirect) influencing adoption of CAWT.

forestry and land in Kenya were analyzed using policy analysis questions (Bullen, no date). This was followed by purposive sampling to identify 26 key informants who included government officials and staff and non-government organization (NGO) workers in the agriculture, forestry and land sectors who were conversant with conservation agriculture and policy issues, to elicit expert opinion on existing incentives and disincentives. Through an open-ended checklist, the key informants were asked to explain how existing policy incentives or disincentives promoted or hindered scaling up of CAWT. This informed the choice of top three incentives for each of the three policy incentive/disincentive categories (Figure 2) that were subjected for prioritization at the local level.

At the local level, survey-interviews were carried out, to identify ways that increase policy incentives and reduce policy gaps. The survey was carried out between May to August 2011 in two

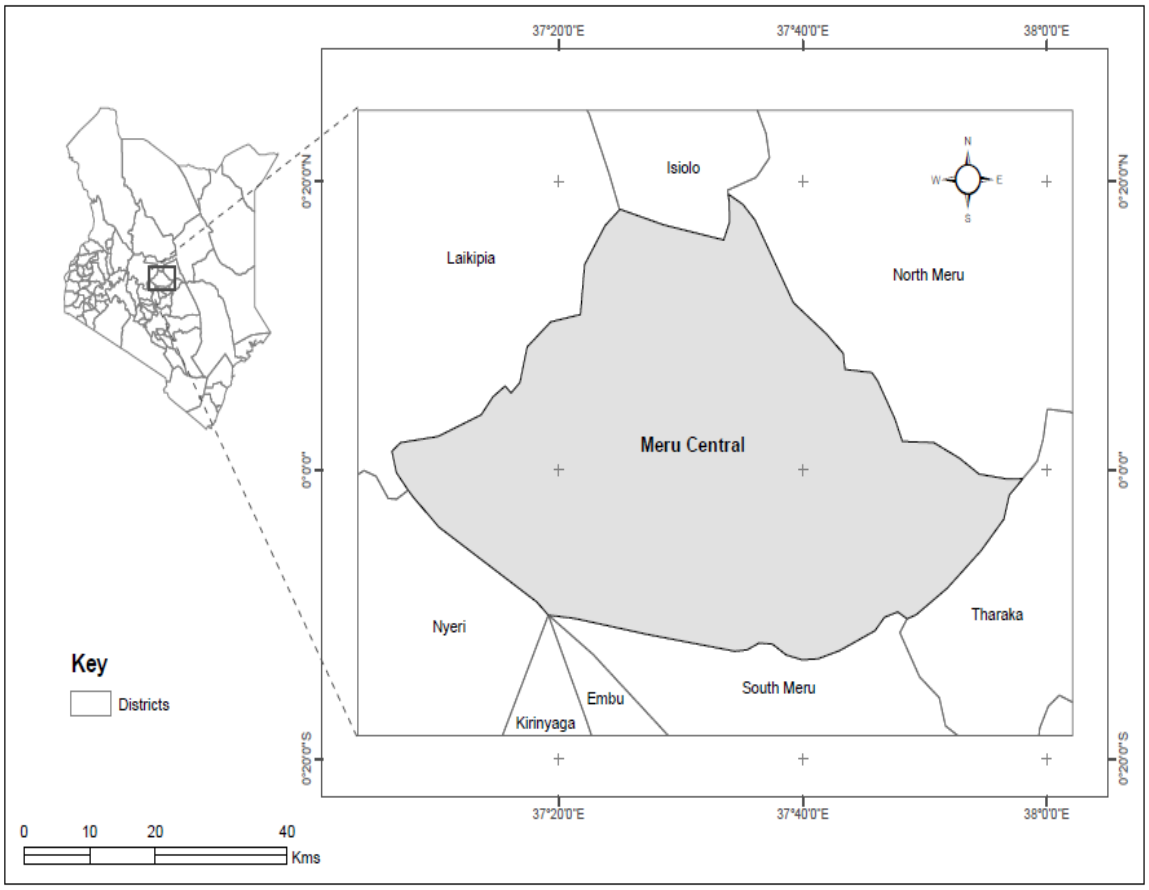

Figure 3. Map of Meru Central district in Kenya.

divisions each in Meru (Figure 3) and Kibwezi (Figure 4) Counties involving sixty (60) randomly sampled small scale farmers for each of the Counties The sample size was based on population and statistical requirements. Based on the 2009 Census, the population of households in Meru Central district was 37,209 while the population of households in Kibwezi district was 52,979 (KNBS, 2009). The sample size was calculated according to Wonnacott and Wonnacott (1977) using the equation following:

$$n = \frac{1.96^2\pi(1-\pi)}{c^2} = \frac{1.96^2 0.5(1-0.5)}{0.126^2} = 60$$

Where: 1.96 is the z-value for a 2-sided 95% confidence interval, c=0.103 is the desired maximal half-width of the confidence interval, and π=0.5 is the population proportion that results in the widest confidence interval for a given sample size (worst-case for a conservative estimate of sample size). *n*=number n required to estimate population proportions π with 95% confidence level. Kibwezi and Meru Counties represent contrasting agro-ecological zones, the semi-arid and humid areas, respectively, which can inform the study on differing or similar issues between different agroecological zones within the same region in Eastern Kenya. Meru Central district predominantly lies in the Upper Highland (UH), Upper Midland (UM) and Lower Midland (LM) agro-ecological Zones (Jaetzold et al., 2007) with annual mean temperature of 17.8°C and total annual rainfall ranging from 400 to 2200 mm. The rainfall is bimodal with long rains from March to June and short rains from October to December. These rains make it possible to harvest major crops twice a year. The soils are mainly humic Nitisols (Jaetzold et al., 2007). Kibwezi district lies in the Lower Midland (LM), Lower Highland (LH) and Inner Lowland (IL) agro-ecological zones (Jaetzold et al., 2007). It has an annual mean temperature of 22.6°C and annual average rainfall of about 600 to 900 mm. The rainfall is bimodal, hence two seasons per year with long rains season starting from March to July and short rains season from October to December. The soils are predominantly luvisols and ferrasols (Jaetzold et al., 2007). Kibwezi is a dryland area where tree production is mainly practised by resource-poor farmers who largely base their decisions on multiple bio-socio-economic factors (Wekesa et al., 2011). In Meru, forest resources are utilized for commercial purposes, especially timber production, hence for sustainable tree harvesting, small scale farmers practice on-farm tree domestication (Lengkeek and Carsan, 2004).

RESULTS AND DISCUSSION

Profile of households

In Meru Central district, the average farm size was 4.46 acres (1.8 ha), with a median of 2 acres (0.8 ha). The average total land holding for farmers in Kibwezi was 26.03 acres (10.5 ha) with a median land holding of 13.5 acres (5.5 ha). Kibwezi district, formerly known as

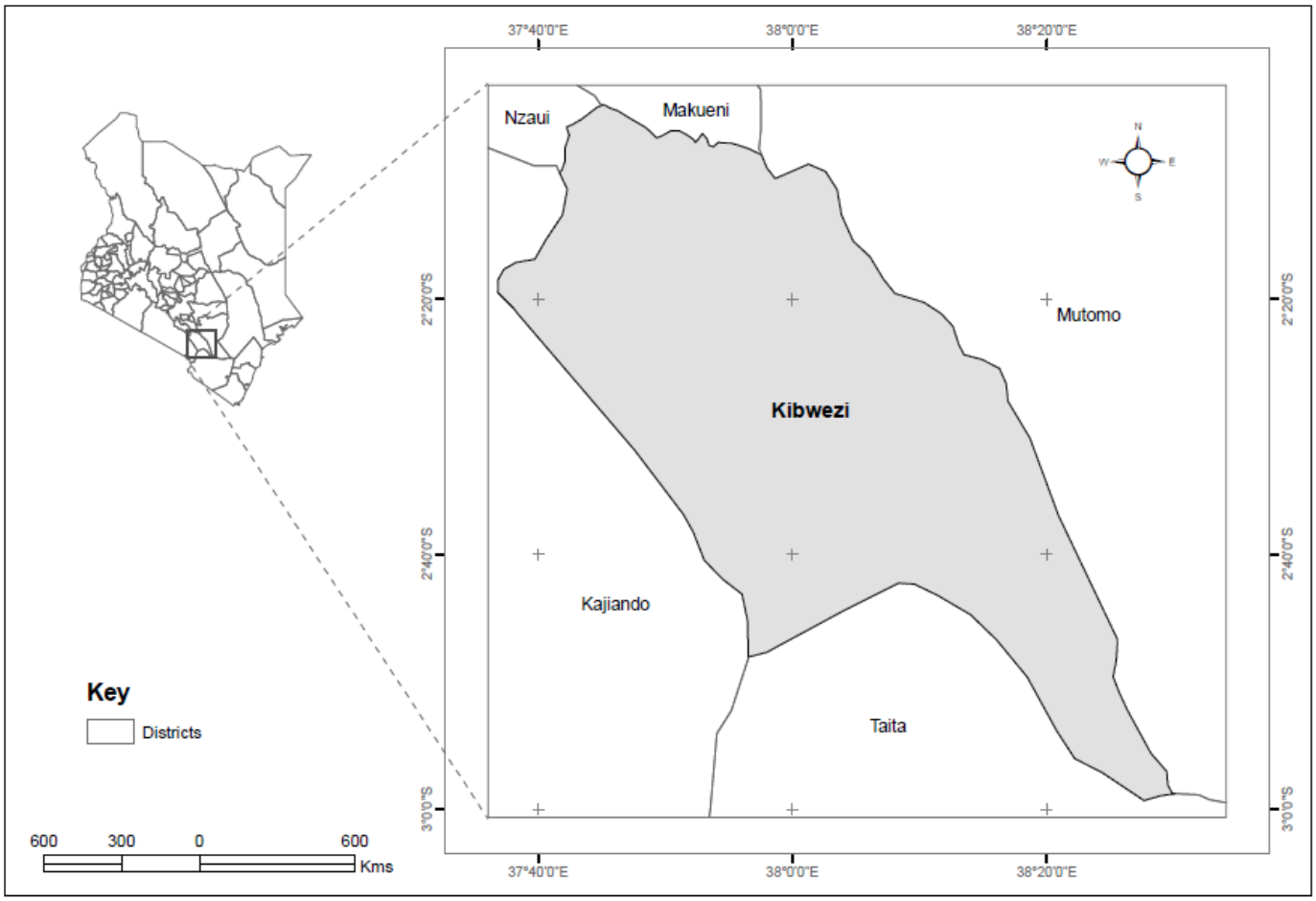

Figure 4. Map of Kibwezi district in Kenya.

Kibwezi division occupies the southern plateau of Makueni district, and is a semi-arid region with inherently low fertile soils and large land sizes, with small scale land holding size in the Lower Midlands (LM) agroecological zone ranging between 2.88 ha (7 acres) and 5.45 ha (13 acres) (Jaetzold et al., 2007). In one study, the average land holding size in Kibwezi was 7.7 ha while the area under crop cultivation was only 0.49 ha (Nyariki et al., 2002). In a study conducted in the same area by Speranza et al. (2008), at least 72% of households were simultaneously engaged in crop production and livestock keeping, hence most small scale farmers in semi-arid areas could be agro-pastoralists.

Though there is a wide range in size of area under crops, Speranza et al. (2008) reported that the median landholding was 10 acres (4 ha) while the median farm size was 4 acres (1.6 ha), representing 18% of the sample size. Further, among the various clusters of cropland size, the lowest cropland size, representing 17% of the population, was 0.8 ha (2 acres) (Speranza et al., 2008). It is quite common that landholdings in arid or semi-arid lands are larger than in high-potential areas, but actual cultivated lands or farm sizes are expected to be much smaller due to inherent limitations in dry areas and lack of financial capital among farmers to cultivate their large landholdings.

However, in this study, since the initial land acreage only considered land holding size, rather than farm size, a median land holding of 10 acres (4 ha) and minimum cropland size of 0.8 ha was used to standardize the original land holding sizes by a factor of 20% of crop farm size. The standardized cropland size resulted in an average crop farm size of 5.2 acres (2 ha) and a median of 2.7 acres (1 ha) among small scale farmers in Kibwezi district.

In Kibwezi, 35% of the respondents were between 50 and 59 years, only 3% of the interviewed respondents were between 20 and 29 years old. In Meru, 32% of the respondents were aged between 40 and 49 years while 6% of the respondents were between 20 and 29 years. This indicates that agricultural activities were mainly left for the retired and older members of the community. Mwangi et al. (1996) agrees that farming has been left to older members of the family while the youth have opted

for white collar jobs or otherwise unwilling to engage in agriculture. This trend may shed some light on the low uptake of newly introduced farming techniques by respondents, since the older people may not be willing to engage in a 'trial and error' situation. Further, it has serious ramifications, especially when food insecurity is a major concern, yet sustainable agricultural practices are still not widely practiced.

National policy setting: Policy incentives and disincentives

The analysis focused on the various incentives and disincentives existing in six policies: (i) Agriculture Act (Chapter 318), (ii) Agriculture (Basic Land Usage) Rules, (iii) Agriculture (Farm Forestry) Rules, (iv) Forests Act 2005, (v) National Land Policy, and (vi) Agricultural Sector Development Strategy. The study revealed that the existing incentives are general in nature, and do not necessarily target, or disaggregate rich and poor farmers. These policies are intended to be inclusive to all types of farmers; however, in practice, they have inadvertently been more accessible to rich or large scale farmers who are more capital endowed, hence are in a better position to invest in, and adopt sustainable agricultural practices:

1. The Agriculture Act[1] (GoK, 1955) emphasizes conservation of soil and prevention of the adverse effects of soil erosion by imposing rules for preservation, utilization and development of agricultural land. A major consequence of the Act is its non-targeted nature, where, for instance, it[2] categorizes particular crops as scheduled crops, namely wheat, barley, oats, beans, finger millets, sorghum, rice, sunflower and sugarcane for which their producers benefit by virtue of their prices being fixed[3] and the provision of different guaranteed minimum prices[4] as well as fixing price at which any scheduled crop may be marketed by any agent, as indicated in Section 16 (GoK, 1955). These crops are not all inclusive of all agricultural produce and furthermore they tend to be grown by large scale farmers, hence the incentives apply to the large scale farmers, leaving out the small scale farmer. The Act[5] mandates the establishment of Authorities in cases where a particular crop should be promoted or fostered, and this has been the basis of existence of majority of the Authorities in the current agricultural sector. The concentration of these pieces of legislation is on the sub-sectors that were traditionally considered as major export earners and were developed during the colonial times including coffee, tea, maize and dairy. The impacts that these organizations have had on small scale farmers vary, especially with collapse of some key agricultural and marketing organizations, leaving the small scale farmer vulnerable with potentially no easily accessible market for the small scale farmer's produce, hence acting as a disincentive, unlike a large scale farmer who has a competitive advantage due to economies of scale and hence can easily access alternative market for his produce. Recent legislative actions have attempted to reduce this red-tape. The Kenya parliament passed the Agriculture, Livestock, Fisheries and Food Authority bill in December 2012, which brings together many segments of the former agricultural statutes and collapses all statutory authorities within the sector into four to improve efficiency and remove redundancy (GAIN, 2013). These marketing authorities have therefore been declared redundant and even small scale farmers could access markets better in the new legislative framework

2. The Agriculture (Basic Land Usage) Rules, issued in 1965, are set out to reduce soil erosion by ensuring that sloping areas remain uncultivated as well as protecting riparian systems (GoK, 1965). In the context of CAWT, the Policy promotes maintenance of permanent soil cover, though in a punitive way, by punishing people who farm across the contours in areas exceeding 12% slope. It also holds liability to people who cultivate any boundary furrows, trenches or ditches on such land. Although the regulations relate to CAWT, there exists no clear incentives for a small scale farmer since for the offence, one is liable to a fine not exceeding KES 5,000 or to imprisonment for a term not exceeding six months, or both. Policymakers concede that the regulations have been unsuccessful in curtailing land degradation, owing partly to lack of resources to monitor and sanction different land uses and a failure by the law to involve communities in the enforcement and management of agricultural resources (Mumma, 2004).

3. The Agriculture (Farm Forestry) Rules of 2009 was set up with the aim of maintaining a 10 percent farm forest cover of every agricultural land holding (GoK, 2009a), a key entry point to CAWT adoption among small scale farmers. The Policy [6] offers an incentive in the form of a 'Compliance Certificate' (Form CFF1) for a land owner or occupier who complies with a Government inspector upon notice to maintain a 10 percent farm forestry or nursery requirement. This is the furthest the incentive goes hence may not be a key motivation as the certificate does not translate to any tangible gains from acquisition of the certificate for the compliant farmer. Section 11.1 of the Act offers an incentive of valuation of damage and tree compensation guidelines to a land owner or occupier who suffers damage to his farm forest trees. This is especially helpful to a small scale farmer who may have limited capital endowment to ensure that animal trespassing is eliminated. However, where damage is due to public utility service, no compensation or

[1] Chapter (Cap) 318
[2] Section 5.1a
[3] Section 7
[4] Section 11
[5] Section 191.1
[6] Section 6.3.ii

commitment to the farmer is assured[7]. Another disincentive for the farmer is that review of farm tree compensation guidelines will be done after every five years, as stipulated in Section 10.4, which is too long a period and it may not reflect the true value of the damage incurred by the less resource- endowed small scale farmer. For a small scale farmer who may have maintained trees for other uses, there is an inhibitory regulation stipulating that a person shall not harvest trees from a farm forest without notification and approval by the District Agricultural Committee (DAC), for which a farmer has to incur a cost in the form of time and transport charges.

4. The Forest Act (2005) provides for the establishment, development and sustainable management, including conservation and rational utilization of forest resources. The Act also establishes the Kenya Forest Service (KFS), a statutory body mandated to manage state forest resources and to promote agroforestry and other private forestry enterprises. Section 24.1 of the Act provides an incentive for people who own private forests as well as arboreta and recreational parks to get registered with the KFS hence entitled to receive technical advice on appropriate forestry practices from KFS as well as receive loans to develop the forest.

The recipients are further exempted from payment of land rates and such other charges on land under which the forest is established (GoK, 2005). Obviously, this incentive fits more for capital endowed individuals owning private forests, institutions or body corporates, not a small scale farmer, who may not even own a mini-forest, defined as a group of trees occupying less than 10 ha of land.

To enhance community participation, Section 46.2 of the Act introduces Community Forest Associations (CFA), whereby the members are entitled to 'forest user rights' such as harvesting of timber or fuel wood, grass harvesting and grazing, among other benefits. As society is dynamic and community arrangements may not always be possible for every small scale farmer who may have time constraints, it does not offer any arrangements for those opting out of these community arrangements.

The Act enhances personal accountability by discouraging livestock straying into forests to the extent of auctioning them after five days upon failure by the owner to reclaim them, proceeds of which are paid to the owner less the amount incurred by KFS for the cost of caring for them (GoK, 2009a). The Forest Service General Order 2010/2011, a directive of the KFS, presents some costs for the public to use forest services and products. It charges a farmer for valuation, for example for damage assessment, which is charged at 5% of the gross value of the damage that has been incurred by the farmer (Kenya Forest Service, 2010) Appendix 1.

[7] Section 10.5

Although this is a revenue generating method and hence an incentive to the KFS, which subsequently guarantees that they deal with only genuine cases, it may prove to be a disincentive to a small scale farmer. A farmer may opt for other grievance solving mechanisms, or altogether abandon farm forestry as a method of reducing possible conflicts with neighbours in cases of animal straying, especially during the dry seasons. On the other hand, there exist some incentives that could reduce deforestation especially among small scale farmers. KFS charges KES 100 for monthly fuel licence for firewood, KES 500 for forest land rent for cultivation per acre per year and KES 20 for charcoal movement permit per bag (Kenya Forest Service, 2010).

5. The Sessional Paper Number 3 of 2009 on Kenya National Land Policy (NLP) has heralded the first single clearly defined and codified National L and Policy in Kenya. It comprises an overall framework and a set of principles to guide reforms in land administration and management and will form the foundation upon which the administrative and legislative framework will be built. The NLP takes an even more holistic approach, providing incentives such as security on community land, acquisition of land rights by inheritance, with or without a will, to promotion of soil conservation methods (GoK, 2009b). However, some incentives have turned out to be a disincentive to small scale farmers. In line with the NLP, the introduction of taxes, formation of cluster settlements, minimum land size determination and privatization of delivery of services, such as valuation and survey are issues faced by small scale farmers, because of their inability to pay taxes, especially during the initial years, and to incur the costs of valuation and survey, in view that the incurred costs may not be necessarily subsidized. The private surveyors who may have been contracted by the Ministry of Lands may not be facilitated; hence in some inaccessible areas, the officers in charge may be demotivated to perform their duties.

6. The Agricultural Sector Development Strategy (ASDS) marks an ambitious policy approach by merging 10 different sectors to provide a more integrated policy framework with minimum duplication and increased efficiency (GoK, 2010).

The ASDS is tailored to benefit small scale farmers in its aim to improve agribusiness and market access. An incentive that closely relates to CAWT is the facilitation of multiple cropping with the aim of enhancing productivity per unit of land as well as woodland rehabilitation and afforestation projects introducing high-value commercial tree species. However, high costs associated with certified tree seedlings prove to be a disincentive to small scale farmers, who may end up going for inferior quality seedlings and after disappointing yields, give up on the project. The Forest Service General Order (Kenya Forest Service, 2010), charges KES 15 and KES 10 for indigenous and exotic single plants, respectively, in less than 15 cm of polythene tube per plant, and KES 75 and KES 50 for the same plants, respectively for single plants

Table 1. Influence of the various policies on small scale farmers.

Policy	Count	Influence					
		Discouragement (Disincentive)		Encouragement (Incentive)		Total	
		N	%	N	%	N	%
Need for permit	Observed	53	44	66	55	119	99
	Expected	25.1	21	93.9	78	119.0	99
10% farm forest	Observed	14	12	105	88	119	99
	Expected	25.1	21	93.9	78	119.0	99
Tree cutting restriction	Observed	28	23	86	72	114	95
	Expected	24.0	20	90.0	75	114.0	95
No minimum land size limit	Observed	33	28	84	70	117	98
	Expected	24.7	21	92.3	77	117.0	98
Irrigation agriculture	Observed	13	11	107	89	120	100
	Expected	25.3	21	94.7	79	120.0	100
Access to extension officers	Observed	6	5	102	85	108	90
	Expected	22.8	19	85.2	71	108.0	90

in more than 15 cm diameter of polythene tube per plant. One of the flagship projects entails exploring the possibility of providing a livestock insurance scheme for producers in arid areas (GoK, 2010a) which is well-intended but may prove to be impractical as far as regular premium contributions from the small scale farmers are involved.

Perceived incentives and disincentives of national policies at the local level

Farmers in Kibwezi and Meru were asked about their knowledge of national policies on land management, agriculture programs and agriculture extension, and on specific policy incentives and disincentives, as well as their perspectives on tree planting and harvesting regulations. Key regulations within the agriculture, forestry and land sectors that were deemed by key informants to be well known at the local level were discussed with farmers. In the forestry sector, the following regulations were examined: (i) policy that requires one to acquire a permit before cutting down trees, (ii) restrictions on cutting and transporting timber products, (iii) the directive to have at least 10% tree cover on every farm, otherwise referred to as the Agriculture Farm Forestry Rules of 2009. In the land sector, (iv) thelack of restriction on minimum land size cultivated was examined while in the agricultural sector, the following regulations were examined: (v) promotion of irrigation agriculture and (vi) extension officer-farmer trainings. The study hypothesized that more policy disincentives exist than incentives to small scale farmers. Hence, a cross-tabulation was carried out to evaluate the influence of the various policies. For all the six investigated policies, more respondents were encouraged by the policy that required one to have a permit before cutting down trees (55%), the 10% tree cover regulation (88%) and the tree cutting restriction (72%). In the land sector, the lack of restriction on minimum land size proved to be an encouragement for sub-division of land to 70% of the respondents. Lastly, in the agricultural sector, 89% of the respondents were encouraged by the promotion of irrigation agriculture whereas 85% were encouraged by the extension officer-farmer trainings (Table 1). A Pearson chi-square test of independence was done to establish whether the results obtained were by chance or statistically significant. At a significant level of <0.001, the research hypothesis was rejected.

The above finding corroborates with the study by Yatich et al. (2007) that looked into institutional and policy context for natural resource management in Kenya, suggesting that existing policies offered more incentives than disincentives, and which notes further that there is a myriad of supportive policies and legislation already in place. However, Catacutan and Piñon (2009) suggest that even if in theory the policy environment is conducive for the development of Vegetable Agroforestry Systems

Table 2. Respondent opinions on the need for a permit before cutting trees.

Reason	Kibwezi		Meru	
	N	%	N	%
Limiting as it requires consulting others	7	11.7	16	26.7
Controls tree cutting	28	46.7	13	21.7
Environmental conservation	2	3.3	4	6.7
Time consuming and cumbersome	4	6.7	20	33.3
No response	19	31.7	7	11.7
Total	60	100	60	100

Table 3. Respondent opinions on the 10% farm forest cover.

Reason	Kibwezi		Meru	
	N	%	N	%
Benefits of trees	29	48	42	70
Environmental conservation	9	15	1	2
Land is small	2	3	10	17
No response	20	33	7	12
Total	60	100	60	100

in the Philippines, the benefits to small scale farmers remain limited. In the same framework, although the study concluded that there existed more policy incentives for CAWT, a more nuance question was whether small scale farmers benefitted from such policies. It was also important to understand the underlying reasons when farmers do not benefit from incentive policies by examining their responses.

Perspectives of small scale farmers on policy incentives and disincentives

Policy disincentives

About one third of respondents, 33.3% in Kibwezi and 26.7% in Meru (Table 2), cited frustrations that were associated with the need for a permit to cut trees, as it was time consuming. This could be attributed to lack of external incentives or any provision for policy compliance, casting doubt on whether these policies are targeted to small scale farmers. A study on awareness and understanding of the exact provisions of bylaws on adoption of improved fallows among farmers in Eastern Zambia reveals that the level of awareness of agroforestry farmers regarding the existence of the bylaws is generally poor and that there is generally also a poor understanding of the exact provisions of these laws (Ajayi and Kwesiga, 2003), if they do exist.

Policy compliance due to direct personal benefits rather than external incentives

The key reason for policy compliance may have been due to personal benefits gained by, for example, maintaining trees on farms. Of the respondents interviewed on how harvesting permits influence their practice of CAWT, 55% (Table 1) viewed it as an encouragement because it controlled tree cutting. This view was predominant in Kibwezi where almost half (47%) of the respondents agreed with that view compared to 22% of respondents in Meru (Table 2). A probable reason for this could be that in Meru, trees are considered more for commercial purposes (Lengkeek et al., 2006; Carsan and Holding, 2006; Lengkeek and Carsan, 2004) hence controlled tree-cutting limited their utility, while in Kibwezi, it has been found that agroforestry systems that improve efficiency with which water and land are utilized (Ong et al., 2002), hence controlled tree cutting was encouraged. However, some respondents (32% in Kibwezi and 12% in Meru) considered the policy as neither encouraging nor discouraging (Table 2). It is likely that the respondents, especially in Kibwezi, did not benefit from the policy, since there were no external incentives extended for controlling tree cutting, but have been inherently beneficial to them because they personally experienced the various tree benefits-nonetheless, the policy may have reinforced compliance.

With regards the 10% farm forest cover regulation, 88% of the respondents viewed it as an encouragement (Table 1) because majority of them (48% in Kibwezi and 70% in Meru) were able to relate to the various benefits of trees. In Meru, 17% found it as a discouragement mainly due to smaller land sizes (Table 3), and raised concerns about tree-crop competition in smaller plots, pointing the need for training on proper tree spacing, planting the right tree-crop combinations that encourage positive interactions,

Table 4. Respondent opinions on restriction of tree cutting and transportation.

Reason	Kibwezi		Meru	
	N	%	N	%
Controls tree cutting	8	13	16	27
Environmental conservation	20	33	7	12
Benefits of trees	6	10	6	10
Limiting as it involves consulting others	0	0	13	22
No response	26	43	18	30
Total	60	100	60	100

Table 5. Respondent opinions on promotion of irrigation agriculture.

Reason	Kibwezi		Meru	
	N	%	N	%
Increased yields	31	52	33	55
Flexibility in planting	8	13	8	13
Increased income	2	3	1	2
No response	19	32	18	30
Total	60	100	60	100

pruning and other management practices. On the other hand, while the issue on small farm sizes was raised, most small scale farmers in Meru may have surpassed the 10% threshold by now and hence the issue of understanding the 10% requirement rather than the proportion itself could have been a bigger issue. The overriding response of the benefits of trees further showed that small scale farmers did not depend on external incentives to comply with the 10% tree cover regulation. The non-reliance on external incentives is not surprising, but the rationale for compliance may vary from region to region. Enforcement of the by-laws relating to improved fallows in Eastern Zambia is based essentially on moral persuasion, that is, encouraging persuasion by appealing to the moral conscience of members of the community (Ajayi and Kwesiga, 2003). The respondents (33% in Kibwezi and 12% in Meru) who regarded the regulation as neither an encouragement nor a discouragement may signify that the impacts of the 10% tree cover regulation have not been felt at the local level. This is because the Ministry of Agriculture is still laying strategies for implementation of the policy. It is probable that once it's implemented, its impact could be augmented if incentives such as seedlings are provided to farmers to enable them to plant trees.

Poor policy enforcement

A probable reason why punitive policies may have been deemed encouraging by the respondents may be because there exist 'escape routes' contributing to low enforcement of the policies. Respondents were asked on their view as regards to restriction on cutting and transporting specific trees that were considered endangered. Seventy- two percent of the respondents (Table 1) deemed the policy as a positive one, because it contributed to conservation of rare tree species, as suggested by 33% of the Kibwezi respondents, while 27% of the Meru respondents were of the view that it controlled tree cutting (Table 4). The highest proportion of respondents (43% in Kibwezi and 30% in Meru) considered the regulation as neither discouraging nor encouraging (Table 4). Since the regulation was punitive, it may suggest that there were 'escape routes' that the respondents could utilize to circumvent it. Further, this implies that that the implementation of this policy could be poor or non-existent. Elsewhere, such restricting policies have been reported to be a disincentive, such as in Ghana (Oduro et al., 2012).

Policies considered by farmers as neither encouraging nor discouraging could be because they may not have experienced the implementation of the policy at the local level, hence they could not relate to it. Majority of the interviewed respondents (88%) (Table 1) viewed the policy on irrigation agriculture as an encouragement to CAWT adoption, since irrigation is a critical input that increases yields, especially in arid areas where rainfall is a key limiting factor. Furthermore, 13% of respondents in both Kibwezi and Meru were of the opinion that it would offer them flexibility in planting (Table 5). However, as the government has not provided irrigation to most areas in the two counties, a third of the respondents did not consider its influence as either positive or negative as its

Table 6. Respondent opinions on extension officer-farmer trainings.

Reason	Kibwezi		Meru	
	N	%	N	%
Farmer acquired knowledge and skills	37	62	35	58
Farmer got assistance	5	8	9	15
No response	18	30	16	27
Total	60	100	60	100

Table 7. Respondent opinions on lack of restriction on minimum land sizes.

Reason	Kibwezi		Meru	
	N	%	N	%
Not economical	14	23	1	2
High production	9	15	0	0
No limits on land sizes	20	33	29	48
Controls land subdivisions	1	2	1	2
Offers security and independence	0	0	18	30
No response	16	27	11	18
Total	60	100	60	100

impact had not been felt by the local people. About a third of the respondents (Table 6) were neither encouraged nor discouraged by extension programs perhaps due to their poor access of extension services. Results from the National Agriculture and Livestock Extension Program (NALEP) Phase I (July 2000-June 2005) indicate that farmers who could exploit the Project's benefits are usually those with access to other sources of income other than farming. Hence extension services normally excluded poor producers and those in remote areas and farmers with small pieces of land tended to benefit less (Jayne and Muyanga, 2006).

Implications of the selected policies on CAWT adoption

The views of the respondents showed a relatively high awareness on different regulations on tree planting and harvesting as well as the benefits of trees. This suggests that CAWT may meet little or no resistance though this needs to be put in context as minimum tillage is one of the least adopted CA principles and is thus the distinguishing feature of CAWT adoption rather than agroforestry. On the other hand, agroforestry could be considered as a starting point to CAWT adoption, with its ability to incentivize farmers if the trees would offer additional benefits to small scale farmers, as reported by 70% and 48% of the respondents in Meru and Kibwezi, respectively. In Meru, Vitex fischeri, commonly known as Meru Oak, is grown as an important commercial species (Lengkeek et al., 2006), as well as Grevillea robusta (Kehlenbeck et al., 2011; Lengkeek and Carsan, 2004). In addition to these two species, access to germplasm and market for other species preferred for timber production have led to planting and on-farm management of many tree species in the region (Carsan and Holding, 2006). In Kibwezi, Melia volkensii is being targeted as a priority species for dryland farming due to its multipurpose uses, providing termite-resistant timber, wood and fodder (Mulatya et al., 2002; Wekesa et al., 2012). It cannot be ignored that some farmers did not benefit from the existing policies, but perceived or derived personal benefits have motivated them to maintain trees on farms. This is encouraging, although farmers' views could change and their practices may not be sustained. Ajayi and Kwesiga (2003) report that reliance on moral persuasion alone for compliance with bylaws related to improved fallows has not worked well. This may be the case when benefits are not clearly perceivable by farmers but when benefits are clear, such as provision of fodder and timber products, adoption may be easier. Rockström et al. (2009) show that CA improves soil water productivity. In addition, CA and agroforestry are advised in the ASDS (GoK, 2010) hence CAWT would be a practical solution, especially for arid areas. This would in turn, be a long term sustainable incentive for small scale farmers if the policy on irrigation agriculture is implemented.

The Kenya National Land Policy envisages an approach of restricting the economically viable minimum land owned in the different agro-ecological zones (GoK, 2009b), but until lately, there has been no legislation formulated to restrict land sizes. If implemented, this

could meet a lot of resistance from many farmers most of whom have small farm sizes already. This in turn, could be a disincentive to small scale farmers to adopt CAWT.

In Meru, a high potential area where land sizes are limited, only 2% of the respondents interviewed were of the view that the current lack of restriction of minimum land size is uneconomical compared to 23% of the Kibwezi respondents (Table 7). In Kibwezi, even if small farm sizes may not be a key consideration as the land sizes are larger than in Meru, a major concern could be finding means of ensuring the productivity of existing farms, which is more challenging in semi-arid conditions. In a study by Speranza et al. (2008), small farm size was a major issue for only 3% of households in a similar semi-arid area in Eastern Kenya.

The low proportion of farmers that suggested small farm size was an issue was explained by various constraining financial conditions experienced by farmers to increase the productivity of their crop lands. The argument running through this, is that, policy incentives for CAWT adoption in Kibwezi and Meru may vary if landholding or farm sizes are considered; in Kibwezi, a priority policy incentive for CAWT could be provision of sustainable irrigation (which is more costly) whereas, price support for tree-products may be more important for farmers in Meru.

Eighty-five percent of the respondents (Table 1) were motivated by the extension officer-farmer trainings.Sixty-two percent of respondents in Kibwezi and 58% in Meru agreed that is important for farmers to acquire knowledge and skills on knowledge-intensive agricultural practices such as CAWT (Table 6).

However, the share of the extension staff to the total Ministry staff has generally declined since 1995 due to a freeze in Government employment within the Ministry that has led to serious setbacks in government budgets (Jayne et al., 2002; Cabral, 2007) this has led to underfunded operations and maintenance and inadequate extension services (Jayne and Muyanga, 2006).

Ajayi et al. (2007) agree that there is degradation of the extension services and delivery systems in most parts of Africa. The Sixth Prime Minister's Roundtable Committee Matrix (2010) notes that the reforms in research and extension in the agriculture sector over time, have left farmers worse off.

The subdivision of administrative units coupled with rationing of staff recruitment has led to high farmer-extension staff ration. Specifically for CA, a knowledge intensive approach that requires intensive training and frequent follow ups, lack of adequate extension services may lead to lack of uptake of the technique.

A study carried out in Southern Zambia revealed that state agricultural extension services and education curricula had little or no content on soil replenishment technologies due probably to low confidence in handling such topics (Ajayi et al., 2007).Further,Yatich et al. (2007) note that in Government ministries and departments there is frequently a communication gap between field officers, planners and policy makers at headquarters, which can have serious implications for policy implementation. This could be a probable reason the respondents have continued to receive conflicting messages therefore leading to low adoption of technologies, and suggesting a lack of group synergy among small scale farmers. One study (Birner and Resnick, 2010) suggests that social mobilization among peasants in Asia and the absence of comparative movements in Africa are among the factors that explains why Asia launched a Green Revolution and Africa did not.

Policy propositions from small scale farmers

This study agrees with the findings of Catacutan and Piñon (2009) that although policy incentives exist, the benefits to small scale farmers are limited. The study also indicates that there exist policy implementation gaps. These findings further agree with Catacutan and Piñon (2009) who found that policies governing the tree sector and vegetable industry are insufficient to stimulate small scale farmer investment in vegetable agroforestry systems and that several gaps also exist in policy implementation, either due to poor communication or dissemination at the local level. In this study, small scale farmers suggested various methods of increasing policy incentives and reducing policy gaps with the aim of increasing adoption of CAWT.

Various policy incentives that would encourage a small scale farmer to practice CAWT were suggested, such as direct incentives assumed to lower the investment cost to practice CAWT through cost-sharing arrangements (36% of respondents neither agreed nor disagreed), provision of good infrastructure (43% of respondents strongly agreed) and tax relief (26% of respondents strongly agreed) (Table 8). This suggests that direct incentives, also considered as fiscal incentives, are not the most preferred option by the respondents. This finding disagreed with the study by Ajayi et al. (2007) that suggests that fiscal policies such as subsidies and institutional support for certain soil fertility management options may have considerable indirect influence in shaping farmers' decisions on soil fertility replenishment strategies (Ajayi et al., 2007). Birner and Resnick (2010) argue that initial subsidies in credit, fertilizer and irrigation have been crucial for small scale farmers to adopt new technologies but that they have become unproductive in the recent years.

Indirect variable economic incentives that can increase returns on investment were control of input and output prices (31% of respondents strongly agreed), introduction of special taxes (23% neither agreed nor disagreed and23% strongly agreed) and managing foreign exchange rates (30% of respondents strongly agreed)

Table 8. Rating of different policy motivations.

Rating		Strongly disagree		Disagree		Neither disagree nor agree		Agree		Strongly agree	
Incentive	**Type**	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**
Direct	Cost-sharing arrangements	11	9	15	13	43	36	15	13	36	30
	Provision of good infrastructure	4	3	16	13	26	22	23	19	51	43
	Tax relief	15	13	22	18	27	23	25	21	31	26
Indirect economic	Control of input and output prices	17	14	15	13	28	23	23	19	37	31
	Special taxes	21	18	23	19	27	23	22	18	27	23
	Managing foreign exchange	14	12	19	16	22	18	29	24	36	30
Indirect enabling	Extension services	5	4	8	7	15	13	38	32	54	45
	Land ownership security	5	4	6	5	11	9	18	15	80	67
	Market development	6	5	3	3	11	9	20	17	80	67

(Table 8). This category of incentives may not have elucidated strong options as the local people may not be aware of any direct impacts felt at the local level. However, one study shows that the indirect tax on agriculture from macroeconomic policies, such as overvalued exchange rates, was three times the direct tax on agriculture such,as export taxes (Birner and Resnick, 2010).

Indirect enabling incentives that could influence a farmer decision to practice CAWT were also rated. For the purposes of this study, the factors considered were extension services (45% strongly agreed), land ownership security (67% strongly agreed) and market development for farm produce (67% strongly agreed). Overall, respondents strongly agreed on all the indirect enabling incentives as being the most important that could offer the best motivation (Table 8). Again, this finding agrees with Catacutan and Piñon's study (2009) where farmers ranked the top three policy concerns in promoting vegetable-agroforestry systems, namely technology promotion, improvement of marketing system and improvement of local extension as indirect incentives. Ajayi et al. (2007) suggest that market development incentives may include helping farmers get access to niche markets where the produce from farms under sustainable practices, such as CAWT, can fetch higher prices, enhance profit and incite farmers' interests in adopting them. Birner and Resnick (2010) argue that experience has shown that policies that support small farms by correcting market failures inherent in small scale agriculture, especially in the early phases of agricultural development, are a particularly promising strategy to achieve pro-poor growth, yet it is politically difficult to implement such policies.

CONCLUSIONS AND RECOMMENDATIONS

The adoption of CAWT, despite its technical efficiency, is constrained by policy and institutional factors. The main objective of the study was to investigate various incentives and disincentives provided by policies in the land, agriculture and forestry sectors. It appeared that even if there were more incentives than disincentives in existing policies, incentives targeted to smallholder farmers remain limited. Awareness of various policies was quite high, but compliance by farmers had more to do with the direct personal benefits they derive from adopting those policies, than the external incentives they provide, while some policies were considered as neither encouraging nor discouraging. This could be due to the fact that some policies are still nascent, poorly implemented, or not exclusively targeted to small scale farmers.

In view of policy propositions, indirect enabling incentives such as security of land tenure, provision of improved extension services and market development are more preferred by farmers than direct incentives although the latter would have been desirable. Although, this study is limited to Meru Central and Kibwezi districts, the findings provide insights to addressing the specific needs of farmers within differing or similar agro-ecological conditions, in particular, and to improving the overall policy environment, in general, to promote wide-scale adoption of CAWT in Kenya.

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Abbreviations: ASCU, Agricultural sector co-ordination unit; **ASDS,** agricultural sector development strategy; **CA,** conservation agriculture; **CASARD,** conservation agriculture for sustainable agriculture and rural development' **CAWT,** conservation agriculture with trees; **CBO,** community based organization; **DAC,** district agricultural committee; **FAO,** food and agriculture organization of the United Nations; **GAIN**,Global Agricultural Information Network; **GoK,** government of Kenya; **GTZ,** -Sustainet German technical corporation-sustainable agriculture information network; **ICRAF,** world agroforestry centre; **KARI**,Kenya Agricultural Research Institute; **KARI,** Kenya agricultural research institute-national agricultural research laboratories; **KEFRI,**Kenya forestry research institute; **KENDAT,** Kenya extension network for dissemination of agricultural technologies; **KENFAP,** Kenya national federation of agricultural producers; **KENVO,** Kijabe environment volunteers; **NGO,** non-governmental organization; **VAF,** vegetable Agroforestry.

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Appendix 1. Institutional affiliation of key informants interviewed.

Policy role	Numerical code of key informant	Organization
NGOs	1	CASARD
	2	Care of Creation
	3	Red Cross
	4	Sustainet
	5	KENDAT
	6	USAID Kenya Horticultural Competitiveness Project
Research Organizations	7	KARI
	8	KEFRI
	9	KEFRI
CBOs	10	KENVO
Farmers' Organizations	11	KENFAP
	12	KENFAP
Farmers	13	None
	14	None
Policy Implementers	15	Ministry of Agriculture
	16	Ministry of Lands
	17	Ministry of Agriculture
	18	Ministry of Agriculture
	19	Ministry of Agriculture
	20	Ministry of Agriculture
	21	Arid Lands Resource Management Project II
Policy Makers	22	Kenya Forest Service
	23	Ministry of Lands
	24	Agriculture Sector Coordination Unit
Decision Makers	25	Ministry of Agriculture
Policy Enforcers	26	Kenya Forest Service