

Executive summary

With the enactment of Forest and Nature Conservation Act 1995 and consequently rules 2006 legalizing private forest, a number of farmers expressed their interest owning private forest from various pockets of the country. This was evident from increase in the number of private forest applicants. In the west central region of Dagana and Tsirang, about 66 and 25 households respectively solicited applications. Although community forestry scheme has significantly advanced, however, private forestry is far from its take off. In order to better understand the reasons behind and inform policy-makers on field perspectives, private forest appraisal study was conducted in the region. The aims of the study were; to identify farmers' interest and perception on private forest, tree species desired for various household purpose, and policy implementation barriers and outlook. Findings from the survey unfolds that interest and willingness to own private forest is in direct response to forest resource security due to rapid socio-economic and institutional changes notably enabling legal framework. The secured land and tree tenure conferred by private forest guarantees forest resource accessibility to not only present but also future generation. This indicates that private forest has immense potential to take on board and demonstrate forest management closer to people than community forestry does.

Tree species desired for house building timber were; *Michalea champaca*, *Juglans regia* and *Cupressus corneyana*. For firewood for cooking and heating species desired were; *Alnus nepalensis*, *Castanopsis sp.*, and *Quercus griffithii*. For tree fodder for cattle feeding, species desired were; *Ficus roxburghii*, *Ficus cunia*, *Saurauja nepalensis* and for grass fodder *Thysanolaena latifolia* commonly known as tiger or broom grass was the desired multi-use species. The management of private forest is limited to planting of seedlings/wildlings of timber, firewood, fodder and fruit trees.

The public awareness about private forest rules was channelled by the Dzongkhag and gewog forest extension service. Majority of the respondents expressed satisfaction with the current private forest rules and stated that management plan is a prerequisite to achieving sustainability. The respondents stated that trees and plants for sale from private forest other than own use should be levy-free. The overall impression about private forest was that the rules need no amendment. Government support desired by private forest owners were on nursery management and silvicultural guidelines on management. The proposed private forest size varies with proponent's land holdings. At Dungalagang under Tsirang proposes an average of 0.39 ± 0.25 acre. Under Dagana, the kana gewog proposes 1 ± 0.46 acre, Tashiding 0.50 ± 0.29 acre, Tshangkha 0.55 ± 0.44 acre, and Khebesa 1.10 ± 0.54 acre.

Private forest owners enrich their forest by integrating tree and grass fodder species, non-wood forest products yielding plants and fruit and nut trees in order to optimize land productivity and contribute to food security. Yet, private forest owners achieved even more-their actions helped to "cool" the planet by cutting down green house gases (GHG) and sequestering carbon in vegetation and soils. This multistory, multi-species agroforestry system offers potential for carbon storage using ecological "niches" from the high canopy to bottom story shade tolerant crops in agriculture.

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1. Context

The Forest and Nature Conservation Act 1995 (DoF, 1995) decentralizes community and private forest management to local communities with the aim to foster and forge peoples' participation in the sustainable management of forest resources. In order to strengthen the public-community-private partnership and bring about good governance in forestry, the act promulgates the Forest and Nature Conservation Rules 2006 (DoF, 2006) which guides the implementation of community and private forestry programmes nation-wide. Although the Department of Forests made significant achievements in the advancement of community forestry schemes in various pockets of the country, private forestry is far from gaining momentum. A number of farmers, however, have shown their interest in owning private forest in the west central region particularly from Tsirang and Dagana Dzongkhag. Yet, reasons behind their interest and willingness to own private forest is virtually unknown. This could be hypothesized to rapid socio-economic changes resulting in the shortage of forest products, accelerated environmental change and enabling policy environment. Private forest, may guarantee secured access to and control of forest resources than community forestry does. Could this be the reason? In reality, there could be multitude of factors ranging from socio-economic, environment and political changes that drive farmers' interest. So how do farmers foresee private forestry programme in the context of rapidly changing socio-economic and policy environment? The success of decentralized forestry schemes in many developing countries around the globe urges donors to allocate more funds. Thus, decentralized forestry schemes are often labelled as "donors darling" because of greater leap in fostering public-private partnership befitting the disadvantaged and poor groups and addressing sustainability concerns. In Bhutan, however, private forestry is a fledging scheme and a comprehensive understanding about farmer's interest, perception and outlook is necessary to propel implementation and scale-up the programme in the 10th FYP (Five Year Plan). Decentralized community and private forest programme are priorities of the Department of Forests to alleviate rural poverty and foster good governance in forestry.

1.2 Research objectives

The study aims to:

- 1.2.1. Identify farmers' interest and perception about private forest in the west central region
- 1.2.2. Identify tree species for household use, and their management practices and
- 1.2.3. Identify policy implementation barriers and outlook.

2. Approach

2.1 Study area

Tsirang and Dagana Dzongkhag in the west central region were selected due to the number of applicants interested in private forest. This was evident from the checklist of households who has applied for private forest registration under respective village and Dzongkhag. These households list available served as sampling frame.

The number of farmers to be interviewed under respective village and Dzongkhag depended on trade-offs between accuracy, coverage, and cost. A total of 12 private forest applicants from Tsirang and 38 from Dagana Dzongkhag, respectively were interviewed. The survey was administered to 58% of the total private forest applicants from both the Dzongkhag.

2.2 Rapid Rural Appraisal

Farmers' interest and perceptions were solicited using a semi-structured questionnaire interview. The informants were heads of households who make decisions on behalf of the rest of their family. After consulting the Gewog Forest Officer(s), household heads were invited at the Gewog centre(s) or nearby convenient place. Questionnaires were designed to collect information on household demography, and land and livestock holdings. The focus of the survey was to find out farmers' interest and perception about private forest, tree species desired and policy implementation barriers and outlook. The interviewees were 70% male and 30% female ranging in age from 18-81 years and 16-95 years, respectively.

3. Result and findings

3.1 Household demography, land and livestock holding

Table 1 presents the household demography. Kana gewog comprise of highest household size followed by Tashiding, Tshangkha, Khebesa and Dunglagang. Tseza has the lowest household size. Except Tseza, household sizes are comparatively large from the national average (PAR, 2007).

Table 1. Mean (\pm S.D) number of household population size by gender

Dzongkhag Gewog	Tsirang				
	Children male	Children female	Adult male	Adult female	Total
Dunglagang	3 \pm 2	3 \pm 1	2 \pm 1	2 \pm 1	8 \pm 3
	Dagana				
Kana	3 \pm 3	3 \pm 3	3 \pm 2	3 \pm 2	12 \pm 5
Tseza	1 \pm 0	3 \pm 1	1 \pm 0	1 \pm 0	6 \pm 1
Tashiding	5 \pm 5	2 \pm 2	2 \pm 2	2 \pm 1	9 \pm 7
Tshangkha	2 \pm 2	3 \pm 1	2 \pm 1	2 \pm 2	8 \pm 5
Khebesa	5 \pm 2	2 \pm 1	2 \pm 1	2 \pm 1	8 \pm 2

Khebesa has the highest land holding followed by Kana, Tashiding, Tsangkha and Dunglagang (Table 2). Tseza owns the lowest land holdings. The large land holdings are contributed by large dry land holdings per household. Sokshing (leaf litter collection), Tsamdro (grazing) and Tseri (shifting cultivation) land holdings were minimum in these gewogs.

Table 2. Mean (\pm S.D) acre of household land holdings by land category

Dzongkhag Gewog	Tsirang							Total
	Wetland	Dryland	Orchard	Sokshing	Tsamdro	Kitchen garden	Tseri	
Dunglagang	2.41 \pm 2	4.7 \pm 3	1.07 \pm 1	0.24 \pm 0	-	0.98 \pm 1	1.5 \pm 0	6.5 \pm 4.0
	Dagana							
Kana	2.5 \pm 0.4	8.75 \pm 4.9	1 \pm 0	-	-	0.6 \pm 0	-	7.76 \pm 6.9
Tseza	1 \pm 0	3 \pm 3	-	-	-	0.06 \pm 0	-	3.53 \pm 2.0
Tashiding	1.76 \pm 0.9	4.76 \pm 1.8	1.6 \pm 0.7	0.5 \pm 0	-	-	-	7.26 \pm 3.2
Tshangkha	1.57 \pm 1.5	6 \pm 4.2	2 \pm 0	-	-	0.5 \pm 0	0.5 \pm 0	7.04 \pm 4.7
Khebesa	2.95 \pm 3.4	6.15 \pm 3	1.5 \pm 0.7	-	3 \pm 0	-	1 \pm 0	10.5 \pm 5.6

Khebesa and Kana rears the highest livestock population followed by Tsangkha and Dunglagang (Table 3). The lowest livestock holdings were in Tseza and Tashiding.

Table 3. Mean (\pm S.D) number of livestock by Gewog and Dzongkhag

Dzongkhag	Tsirang									Total
	Gewog									
	Local cattle		Improve cattle							
	Siri	Jatsham	Jersey cross	Jer.x Jat	Jat x Nub	Goat	Sheep	Horse	Pig	
Dunglagang	5 \pm 2	3 \pm 1	3 \pm 2	3 \pm 1	2 \pm 0	4 \pm 1	5 \pm 4	-	-	9.5 \pm 6
	Dagana									
Kana	7 \pm 3	3 \pm 0	2 \pm 1	-	-	8 \pm 0	-	-	-	10 \pm 6
Tseza	2 \pm 0	1 \pm 0	6 \pm 0	-	-	-	-	-	-	5 \pm 2
Tashiding	4 \pm 3	2 \pm 1	3 \pm 0	1 \pm 0	-	3 \pm 1	-	-	-	7 \pm 3
Tshangkha	5 \pm 2	-	3 \pm 2	-	-	2 \pm 2	8 \pm 0	1 \pm 0	3 \pm 1	9 \pm 5
Khebesa	5 \pm 0	2 \pm 2	1 \pm 0	-	2 \pm 0	2 \pm 1	-	2 \pm 0	3 \pm 0	11 \pm 6

Note: jer x jat denotes cross between jersey and jatsham and nub denotes nublang breed

3.2 Farmers' interests and perceptions about private forest

Figure 1A, B illustrates the farmers' interest and perception about private forest. Of the total, 68% of respondents stated owing private forest due to limited forest resources (timber, firewood and fodder) available while 22% has no idea and 10% as conserving soil and water. The driving force behind their interests in taking up private forest attributes to guaranteed forest resource rights and benefits conferred by private forest rules 2006 (Fig. 1B).

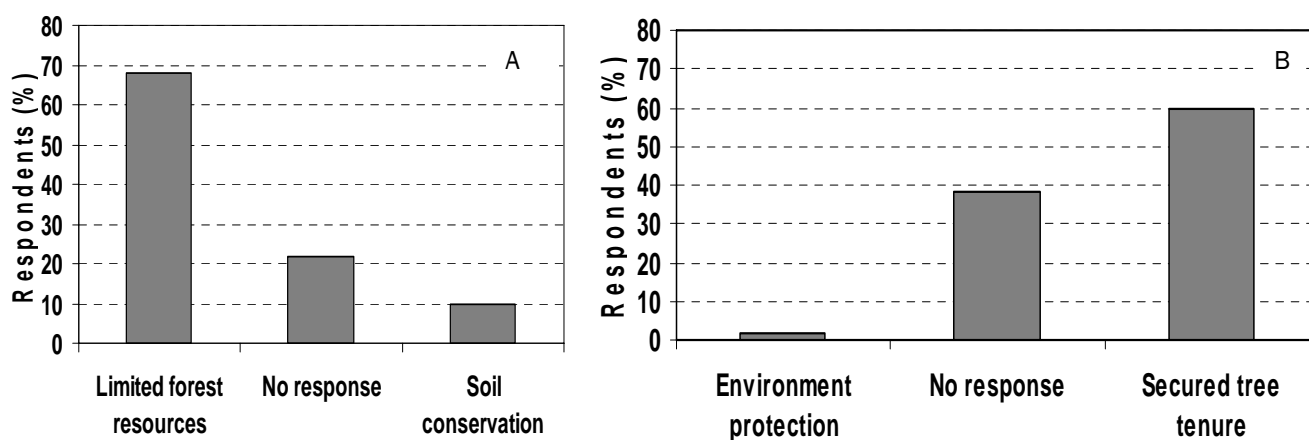


Figure 1. Farmers' interest (A) and perception (B) about private forest

The long-term benefits that private forest delivers are improved access to forest resource to not only present but also future generation (58%), 18% of the respondents has little or no idea about private forest while 14% stated that private forest increases access to forest resources and 10% as increased household income (see Fig. 2).

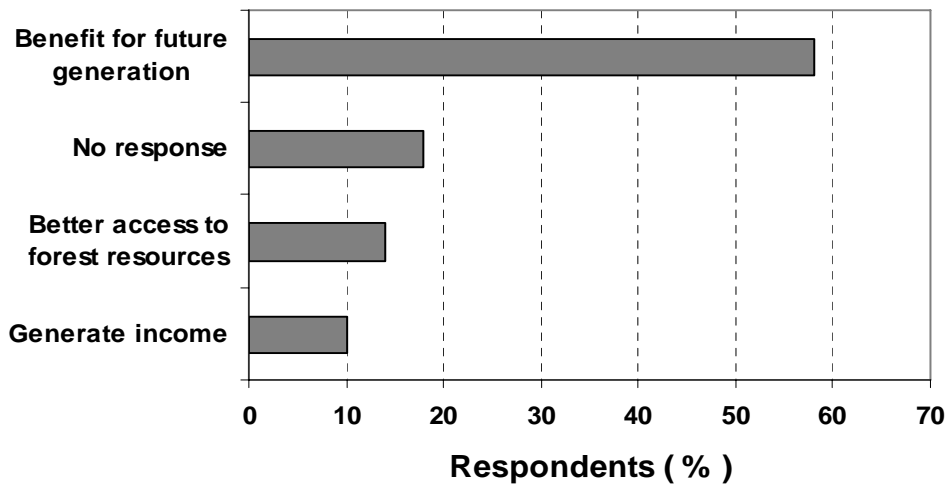


Figure 2. Perceived benefits from private forest

3.3 Tree species desired for household use and management practices

Tree species desired for house building timber were; *Michalea champaca* (72%), *Juglans regia* (58%), and *Cupressus corneyana* (22%) see Table 4. For poles, species desired were bamboo mostly. For firewood for cooking and heating, species desired were; *Alnus nepalensis* (40%), *Castanopsis sp.* (22%), and *Quercus griffithii* (12%). For tree fodder for cattle feeding, species desired were; *Ficus roxburghii* (72%), *Ficus cunia* (52%), *Saurauja nepalensis* (8%) and for grass fodder, species desired were; *Thysanolaena latifolia* (52%) commonly known as tiger or broom grass; and for fruits, species desired were; peach (14%), plum (10%), and pear (10%).

Table 4. Tree species desired for timber, firewood, poles, fodder and fruit for private forest programme

Product	Priority 1		Priority 2		Priority 3	
	Species	Attribute	Species	Attribute	Species	Attribute
Timber	<i>Michalea champaca</i> 36(72)	valuable 32(64)	<i>Juglans regia</i> 29(58)	valuable	<i>Cupressus corneyana</i> 11(22)	valuable
	<i>Schima wallichii</i> 9(18)	durable 3(6)	<i>Tectona grandis</i> 5(10)	valuable	<i>Schima wallichii</i> 5(10)	durable
	<i>Dalbergia sisoo</i> 1(2)	valuable	<i>Alnus nepalensis</i> 4(8)	fast growing	<i>Alnus nepalensis</i> 3(6)	fast growing
	<i>Tectona grandis</i> 1(2)	valuable	<i>Engelhartia spicata</i> 2(4)	durable	<i>Morus levigata</i> 4(8)	durable
Firewood	<i>Pinus roxburghii</i> 1(2)	durable	<i>Castanopsis sp.</i> 1(2)	durable	<i>Terminalia myriocarpa</i> 3(6)	durable
	<i>Alnus nepalensis</i> 20(40)	fast growing	<i>Castanopsis sp.</i> 11(22)	good	<i>Quercus griffithii</i> 6(12)	hard
	<i>Macaranga denticulata</i> 5(10)	-	<i>Alnus nepalensis</i> 4(8)	fast growing	<i>Belschmedia sikkimensis</i> 2(4)	easy splitting
	<i>Schima wallichii</i> 5(10)	-	<i>Macaranga denticulata</i> 7(14)	fast growing	<i>Alnus nepalensis</i> 1(2)	fast growing
	<i>Castanopsis sp</i> 2(4)	-	<i>Quercus glauca</i> 1(2)	good energy	<i>Macaranga denticulata</i> 1(2)	-
	<i>Celtis australis</i> 2(4)	easy splitting	<i>Schima wallichii</i> 1(2)	-	<i>Castanopsis sp</i> 1(2)	-
	<i>Quercus griffithii</i> 2(4)	good energy	<i>Erythrina arboresens</i> 2(4)	-	-	-
	<i>Bamboo</i> 2(4)	straight	<i>Bambusa nutans</i> 1(2)	durable	-	-
Pole	<i>Alnus nepalensis</i> 2(4)	fast growing	-	-	-	-
	<i>Erythrina arboresens</i> 1(2)	-	-	-	-	-
	<i>Salix babylonica</i> 1(2)	-	-	-	-	-
	<i>Schima wallichii</i> 1(2)	-	-	-	-	-
	<i>Ficus roxburghii</i> 36(72)	yields milk 19(38)	<i>Ficus cunia</i> 28(52)	yields milk 15(30)	<i>Saurauja nepalensis</i> 8(16)	yields milk 10(20)
	<i>Ficus cunia</i> 6(12)	good fodder 13(26)	<i>Ficus roxburghii</i> 6(12)	fodder 13(26)	<i>Ficus nerifolia</i> 7(14)	good fodder 8(16)
	<i>Ficus nerifolia</i> 3(6)	palatable 4(8)	<i>Artocarpus lacucha</i> 5(10)	palatable 3(6)	<i>Artocarpus lacucha</i> 5(10)	palatable 3(6)
Tree fodder	<i>Ficus benamina</i> 2(4)	-	<i>Ficus nerifolia</i> 1(2)	-	<i>Celtis australis</i> 2(4)	-
	<i>Artocarpus lacucha</i> 1(2)	-	<i>Celtis australis</i> 1(2)	-	<i>Ficus cunia</i> 2(4)	-
	<i>Thysanolaena latifolia</i> 26(52)	multiuse	<i>Gautamala grass</i> 5(10)	-	-	-
	<i>Bamboo</i> 2(4)	multiuse	<i>Napier grass</i> 1(2)	-	-	-
	<i>Gautamala grass</i> 2(4)	fodder	<i>Banana</i> 1(2)	-	-	-
Fruit	<i>Peach</i> 7(14)	income	<i>Plum</i> 5(10)	income	-	-
	<i>Pear</i> 5(10)	-	<i>Banana</i> 3(6)	-	-	-
	<i>Juglans regia</i> 3(6)	-	<i>Pear</i> 4(8)	-	-	-
	<i>Plum</i> 2(4)	-	<i>Peach</i> 3(6)	-	-	-
	<i>Guava</i> 2(4)	-	<i>Citrus</i> 2(4)	-	-	-

Note: Figures in parenthesis are percentage of total respondents and do not tally 100 percent as only the highest three scores are given.

3.4 Management practices

Of the total, 52% of the respondents do management of private forest such as planting of nursery-raised seedlings of timber, firewood, fodder and fruit trees while 32% planted wildlings from forest. About 54% of the respondents do weeding and 58% do cleaning of the seedlings/wildlings planted. Fewer households collect firewood and poles from their private forest. Besides collection of firewood, no other management is practiced in private forest except guarding from cattle and human. The respondents stated no pest and insect damages in private forest.

3.5 Forest and Nature Conservation Rules

With regard to private forest rules, 32% of the respondents were aware of it and remaining have not heard. Dzongkhag (62%) and Gewog (94%) forestry extension service channelled the public awareness about private forest.

Of the total, 70% of the respondents have not had trouble with the current private forest procedures and rules and 24% otherwise. The respondents who experienced or faced difficulties stated that the registration procedure is lengthy (22%) while majority (78%) were satisfied or did not comment.

Of the total, 92% of the respondents did not experience so far any problem in obtaining permits for felling trees in their private lands while 8% did. With regard to land entitlement category for private forest, the respondents stated that private forest should not restrict to dry land categories only but include others e.g., Sokshing, cardamom orchards and Tsamdro.

Of the total, 68% of the respondents felt that management plan is a prerequisite to achieving sustainability while 30% did not comment, and 4% as no problem and remaining suggests practising singletree felling harvest management in private forest.

With regard to levy on trees and plants for sale from private forest other than own use, 64% of the respondents do not see any difficulties while remaining does. Accordingly, 32% of the respondents stated that sale of timber other than own use should be levy free while 68% did not comment.

Majority (82%) of respondents felt that the current rules needs no amendment while remaining (18%) stated some changes.

3.6 Areas for capacity building of private forest owners

Government support to private forest owners are in nursery management (64%) and silvicultural guidelines for management (62%). This includes seed collection, germination and nursery techniques and a management plan for private forest.

3.7 Proposed land size for private forest

The average proposed private forest size at Dunglagang under Tsirang was 0.39 ± 0.25 acre (Fig. 3). Under Dagana, the kana gewog proposes 1 ± 0.46 acre, Tashiding 0.50 ± 0.29 acre, Tshangkha 0.55 ± 0.44 acre, and Khebesa 1.10 ± 0.54 acre. The proposed private forest size tends to depend on the dry land size an individual farmer owns.

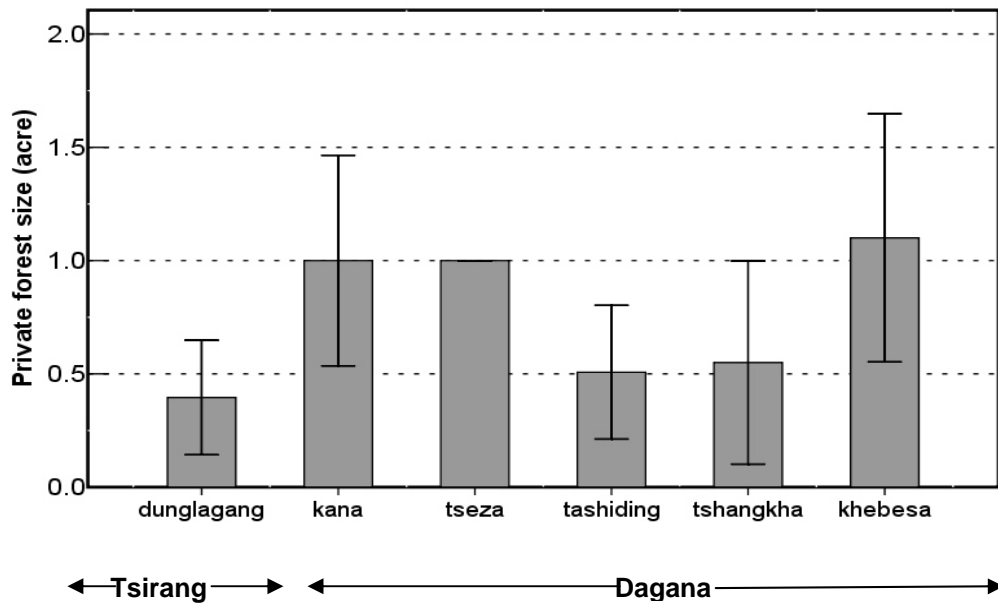


Figure 3. Mean (\pm S.D) of proposed private forest size by gewog

4 Outlook

In order to contribute to food security and poverty alleviation, private forest owners foresee immense potential to integrate tree and grass fodder species (66%), non-wood forest products yielding plants (62%) and fruit and nut trees (46%) see Fig. 4. This stratification in private forest can be accommodated as multi stories. Trees for timber can occupy the uppermost canopy while firewood, tree fodder, and fruit and nut trees occupy middle and grass fodder (e.g., *Thysanolaena latifolia*) occupy ground story resulting in to a multi-species, multi-storied forest.

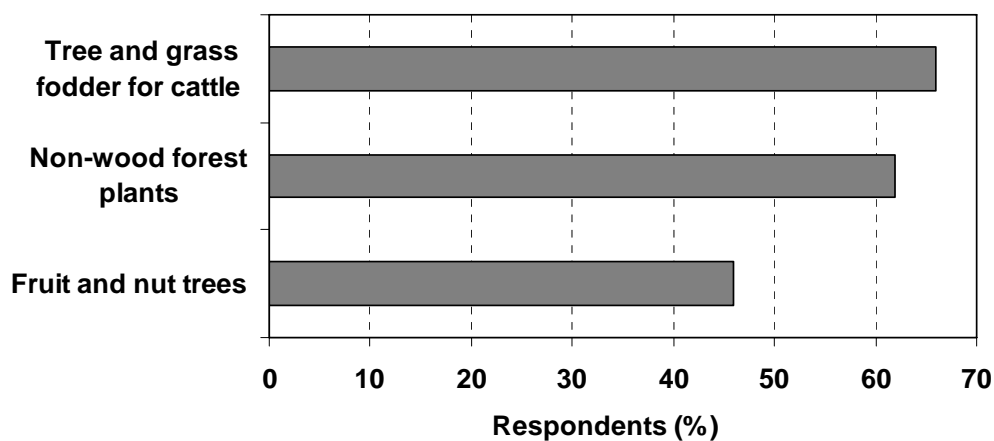


Figure 4. Private forest enrichment option

Private forest owners are already in the business of integrating tree fodder and grasses in order to optimize land productivity e.g., at Dunglagang (see front cover). This way, private forest owners not only meet their forest product for household subsistence but also for future generation. Yet, private

forest owners achieved even more- their actions helped to “cool” the planet by cutting down green house gases (GHG) and sequestering carbon in vegetation and soils. The highest carbon storage results are found in “multistory” agroforestry systems that have many diverse species using ecological “niches” from the high canopy to bottom story shade tolerant crops (Scherr and Sthapit, 2009). Examples could be shade grown cardamom or tea plantation where cash crops are grown under the canopy of trees that sequester carbon and provide habitats for small animals. Simple intercrops would be used where tree-crop competition are minimal. Thus, agroforestry as sustainable land use system can sequester carbon storage in agriculture.

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