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Pilot Study to Investigate a Participatory Approach for Roadside Protection of Rural Roads in Nepal

Roadside Plantation Report (Site-1 & Site-2)

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HELVETAS Swiss Intercooperation Nepal
NEP 2071D
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Cover Photo: RUG members at Site-1, planting broom grass (*amrisso*). Photo by Hari Gurung

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Abstract

The report describes the roadside plantations that were planned and implemented for the two pilot sites in Dhankuta District under project NEP2071D. Site-1 lies in Shahidbhumi Rural Municipality in Dhankuta district and Site-2 lies along the same road corridor (Hile-Chhintang road) and includes parts of both Pakhribas and Dhankuta Municipalities. This second site replaced the earlier proposed pilot site, in Bhajani Urban Municipality in Kailali District that was not possible to use as a pilot due to loss of interest by the concerned municipality. Both pilot sites were initially assessed for land condition and existing vegetation cover. Then site preparation (clearance, land preparation, composting) followed by plantation establishment and protection measures (from grazing animals) were carried out during July 2018. Even though the Right of Way (RoW) has not been fully acquired, the Road User Group (RUG) members, together with the rural municipality representatives have agreed to collaborate on the plantation of broom grass (*amrisso*). There is still an outstanding issue regarding regular road maintenance at both these sites (e.g. infilling of potholes and drainage ditch excavation) which would formerly have been the responsibility of the DDC/DoLIDAR (now known as DoLI) but has now been passed to the Local Government (municipalities). In addition, issues relating to ownership of the existing rural road are not yet clearly defined or resolved.

Key words

Roadside plantation planning, slope stabilisation, Right of Way utilisation, productive land use.

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Acronyms, Units and Currencies

$	United States Dollar (US$ 1.00 ≈ NRS 110)
ADB	Asian Development Bank
AFCAP	Africa Community Access Partnership
ASCAP	Asia Community Access Partnership
DoLIDAR	Department of Local Infrastructure Development and Agriculture Roads, (Now, Known as Department of Local Infrastructure, DoLI,
GPS	Global positioning system
Hh	Household
MoU	Memorandum of Understanding
NRS	Nepali Rupees
ReCAP	Research for Community Access Partnership
RoW	Rights of Way
RUG	Road Users Group
TDP	Town Development Plan
TMP	Transport Master Plan
UKAid	United Kingdom Aid (Department for International Development, UK)

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1. Executive Summary

This report describes the activities that were carried out for roadside plantation site preparation and plantation establishment at the two research sites in Dhankuta District under project NEP2071D. It describes the two pilot sites namely Site-1 in Shahidbhumi Rural Municipality and a new pilot, Site-2, in Pakhribas and Dhankuta Urban Municipalities (along the same Hile-Chhintang road) that replaced the earlier proposed site that had been located in Bhajani Urban Municipality in Kailali district. This earlier site was discontinued as a pilot due to withdrawal of interest on the part of the municipality.

Existing vegetation in the Right of Way (RoW) of the 2.1 km Marga-Dharmasala stretch (Site-2) was assessed. Approximately 356 trees were found, with *uttis* (*Alnus nepalensis*) and *chilaune* (*Schima wallichii*) being the dominant types. There were also some patches of bamboo (*Dendrocalamus* spp.) on the sloping roadside areas. As pilot Site-1 is located along sloping land with no human settlements, there is relatively little cultivation along the roadside, but at pilot Site-2 the pilot road section of site-two has some human settlements with both sloping and terraced lands along the RoW and also some patches of maize and tomato cultivation.

All the RoW land in both the pilot sites is still privately owned and has not been fully acquired by government. Despite this, *amrisso* plantation is supported by the member households of the Road User Groups (RUGs) that have been formed for these two sites because of its income-generating potential and value in roadside stabilisation. In total, 14,150 *amrisso* saplings (6,090 at Site-1 and 8,060 at Site-2) were planted covering a total of 2.86 ha of land. This roadside plantation report covers site clearance, cost of planting materials, composting, fencing and basic tools. Fencing with bamboo poles and plantation of jatropha cuttings (*Jatropha curcas*) as a living barrier has been carried out over a 1,000 m section of Site-1 to protect the young *amrisso* plants from livestock. At Site-2 only 350m of fencing has been carried out over the 2.1 km length because there is a practice of controlled livestock grazing (as opposed to free grazing) which means that it was only necessary to fence the more vulnerable stretches of plantation.

Assessment of the RoW for the purposes of plantation establishment showed that basic road maintenance is also required at both sites. This includes infilling of potholes and re-excavation of the drainage ditches. Although plantation establishment along the RoW can proceed without this work having been done, it will be necessary to carry it out at some point to ensure future road stabilisation. The costs of road maintenance would formerly have been borne by the District Development Committee and Department of Local Infrastructure (DoLI) but under the new Federal system this responsibility has been passed to the municipalities. Shahidbhumi Rural Municipality which covers Site-1 has already agreed to support road maintenance in principle but it can only be funded out of the budget for the next fiscal year. Ensuring that such a budgetary allocation is made, necessitates close and regular coordination with all concerned during the municipal planning process.

2. Introduction

HELVETAS Swiss Intercooperation was awarded a contract by ReCAP to conduct a pilot study on "*Developing a participatory approach for roadside protection of rural roads in Nepal*" over the period 2017-2020. The original project design foresaw the central DoLI as the primary government collaborating partner for the project, along with the District Technical Office (DTO) of the concerned districts. However, as a result of the new Federal Constitution and the subsequent restructuring of the state, this situation has changed. Under the new legislation (Local Government Operations Act, 2047) Local Governments (both Urban and Rural municipalities) now have specific responsibility for rural roads. Since the local elections in 2017, these Local Governments are now functioning with

elected representatives in place and they are taking on their new roles. The role of Federal and Provincial Governments regarding rural roads is now more focused around policy development, standards and strategy development rather than for road construction and maintenance.

The study aims to develop an innovative approach for sustainable management of the RoW on either side of rural roads by promoting productive utilisation of such lands by cultivating appropriate plants (e.g. *amrisso*) and ensuring that those people living along the roadside benefit from the plantation and are thus motivated to maintain it. The study is expected to identify an appropriate model/approach for the utilisation of the RoW in this regard. Moreover, it is expected that the municipalities will benefit from the RoW plantation through reduced maintenance costs, slope protection of the road surface and by developing an appropriate mechanism to share the economic benefits from the income generated by utilising the RoW in this way.

This report describes plantation activities in the two pilot sites both located along the Hile-Chintang road. One of the originally identified pilot sites under project NEP2071D was located in Bhajani Urban Municipality in Kailali District. This site was discontinued in the project due to withdrawal of interest by the municipality and has been replaced by another pilot site that is also located along the same 20 km road from Hile-Chintang. This report covers implementation of plantation activities for both pilot sites. Site-1 (1 km length) falls within Shahidbhumi Rural Municipality and Site-2 (2.1 km length) falls in both Dhankuta and Pakhribas Municipalities.

3. Approach and Methodology

Table 1 gives a summary of the 2 pilot sites and of the plantations established. The following sections describe these in greater detail.

Table 1: Summary of Site & Plantation Characteristics

	Site-1	Site-2	Total
Location	Chhintang (Police station - Sambagaun)	Dharmasala Tower - Marga	
Municipalities	Shahidbhumi Rural Municipality	Dhankuta & Pakhribas Urban Municipalities	
Distance from Hile Bazaar	20 km	5 km	
Length	1 km	2.1 km	3.1 km
Area planted	1.16 ha	1.7 ha	2.86 ha
Approximate altitude	1,200 m	1,600 m	
No. of *amrisso* saplings planted	6,090	8,060	14,150
Length of fencing used	350 m	1,000 m	1,350 m
Households in RUG	17	35	52
Person days used for plantation establishment	260	255	515

3.1 General description of the roadside plantation sites

Both pilot sites are located along the Hile to Chhintang Road. Site-1 in Shahidbhumi Rural Municipality is located about 20 km from Hile Bazaar and 37 km from Dhankuta town at an altitude of about 1,200 m. Site-2 lying in both Dhankuta and Pakhribas Urban Municipalities is located 22 km

from the town of Dhankuta and 5 km from Hile Bazaar at an altitude of almost 1,600 m above sea level.

Site-1 is 1 km in length and covers the section from the Police station – Sambagaun. Site-2 is 2.1 km in length and is located from Dharmasal Tower to the small settlement of Marga Bazaar. Site-2 has gentle slopes within the RoW running along the contour of the hillside and has more settlements compared with Site-1 which has generally steeper roadside slopes and few adjacent settlements.

At the time of road construction about 5 years ago, a drainage ditch was dug on the upper road side in Site-2 to protect it from flood damage during the monsoon. This ditch is now largely filled with silt and debris and needs to be re-dug. Responsibility for its maintenance now lies with the 2 municipalities in which it lies (Dhankuta and Pakhribas Urban Municipalities). Along most parts of Site-2 the drainage is not properly maintained and as a result the road is muddy and affects the smooth passage of vehicles. This increases the transport time and costs of moving agricultural produce such as tomatoes from the producers to local markets.

3.2 Family labour availability for plantation

Road User Groups (RUGs) have been established at both sites. The RUG at Site-1 comprises 17 households with a total of 134 family members, whilst that at Site-2 comprises 35 households with a total of 171 family members. Members of these RUGs were hired as labourers for site clearing and plantation establishment. A total of 515 person-days (260 at Site-1 and 255 at Site-2) from the RUGs were mobilised for bush clearance, land preparation, *amrisso* plantation and fencing. In case a family member was not in a position to supply labour for plantation work, other nearby RUG members extended their help to complete the plantation task.

3.3 Plantation areas

As noted in the First Phase Report (Section 2.2 page 35), the full RoW on either side of the pilot road section is not acquired. The government has recently declared 10 m on either side of the rural road (from the centre line) as RoW. However, of this 5 m on either side still remains in private hands. Nevertheless, the RUG members have reached a consensus to make all the RoW available for plantation with the understanding that this will also be supported by the concerned municipality.

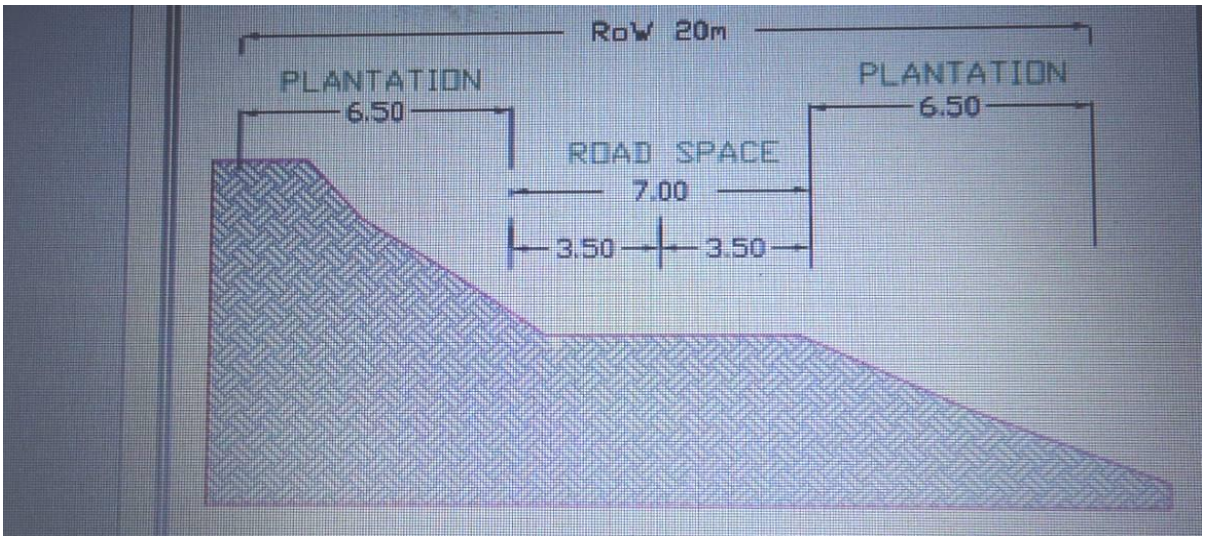
Table 2: Carriageway, shoulder and roadway specifications

	Carriageway width (m)		Shoulder width (m)	Roadway width (m)
District Road (core network)	Hill	5.5 (If traffic> 400 vpd)	0.75	7.0
		3.75 (If traffic > 100 vpd)	0.75	5.25
		3 (If traffic > 100 vpd)	0.75	4.5
	Tarai	5.5 (If traffic > 400 vpd)	1.0	7.5
		3.75 (If traffic > 100 vpd)	1.5	6.75
		3 (If traffic > 100vpd)	1.5	6
		3 (If traffic > 100 vpd)	1.5	6.0
Village road	Hill	3	0.5	4.0
	Terai	3	0.75	4.5

Source: Nepal Road Standard-2055 (2nd edition-2071), DoLI, Ministry of Federal Affairs and Local Development
Vpd means, vehicle per day
Note: Above given width excludes drains, parapets and top of retaining wall

Table 2 and *Figure 1* show the specifications for the carriageway, shoulder, road width and drainage ditches for District and Village roads within the 20 m RoW. This shows that a width of 6.5 m is potentially available for plantation establishment on either side of the road. In practice, this amounted to 1.16 ha at Site-1 and 1.7 ha at Site-2 (see Table 1).

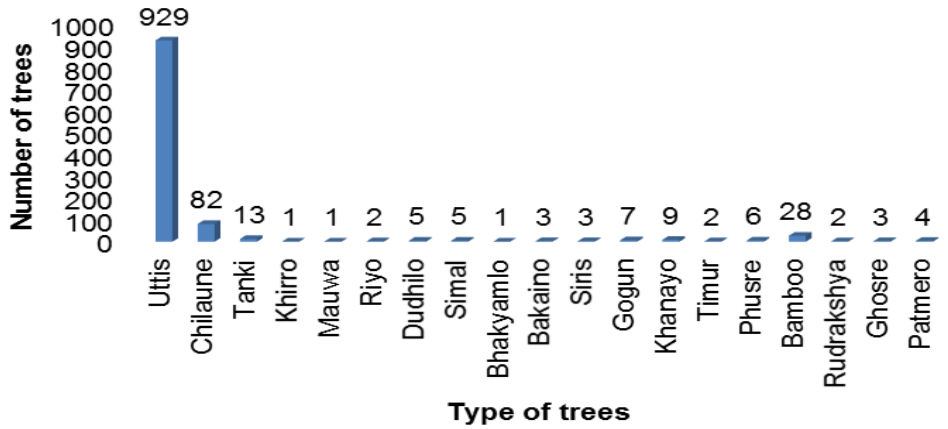
Figure 1: Typical road section showing plantation areas



3.4 Existing vegetation in the RoW

Vegetation cover at the pilot sites was assessed by taking cross sections at 25 m intervals along the road stretch. At Site-1 the vegetation consisted of a mixture of trees, shrubs and some cultivated crops. In total 19 tree species were found, with *utis* (*Alnus nepalensis*) being the most frequent followed by *chilaune* (*Schima wallichii*). There are also some patches of bamboo (*Dendrocalamus* spp.) that have been planted in gully areas within the RoW. Most of the trees have arisen through natural regeneration (rather than being planted). As the land on both sides of the RoW area is steeply sloping, there is little cultivation close to the road, although in small sections, millet, vegetables (tomato), avocado, cardamom and some fruits (orange and pears) are being grown. The most commonly found vegetative cover is weedy species, notably the invasive exotic *banmara* (*Eupatorium adenophorum*); nettle (*Urtica dioica*) and a variety of ferns. Of these plants, *banmara* is widespread along the length of the roadside. It's Nepali name literally means 'forest killer' due to its habit of creating a dense understorey through which tree seedlings have difficulty in penetrating. *Figure 2* shows the variety of tree species observed and inventoried. A list of scientific names for these species is given in Annex 1.

Figure 2: Trees recorded inside RoW



At Site-2 vegetative cover was assessed in the same way. It again comprised a mixture of trees, shrubs and some cultivated crops. In total, 10 types of trees were found, with *utis* (*Alnus nepalensis*) and chilaune (*Schima wallichii*) being the most frequent, followed by *dabdabe* (*Garuga pinnata*, Roxb) and patches of bamboo (*Dendrocalamus* spp.) that have been planted in gullies and sloping areas. RUG members have realised that *utis* areas are over-stocked (too dense) and have thinned some of the trees. This has opened up the space for *amrisso* plantation. Land on both sides of the RoW consists of steep to gentle slopes, some patches of vegetables (tomato) and maize. At pilot Site-2 *amrisso* cultivation plots are already found covering 0.1 ha. Along the whole length of pilot Site-2, the most commonly found vegetative cover was weedy species, notably the invasive exotic *banmara* (*Eupatorium adenophorum*); nettle (*Urtica dioica*); and a variety of ferns. Of these, *banmara* is widespread along the length of the roadside.

Despite the slight difference in elevation between Site-1 and Site-2, there is much similarity in the vegetative cover. Both sites are within the range within which *amrisso* can normally be established (from the Terai – 2,000m)[1].

Table 3: Tree species recorded from Site-2

Nepali name	Botanical name	No. trees in site	% of total
Utis	*Alnus nepalensis*	149	42
Chilaune	*Schima wallichii*	145	41
Dabdabe	*Geruga pinnata*	25	7
Nebaro	*Ficus auriculata*	1	0.3
Siris	*Albiizia morrs*	1	0.3
Khanayo	*Ficus auriculata*	3	0.8
Timur	*Zanthoxylum armatum*	1	0.3
Phusre	*Litsea pulcherimma*	6	1.7
Bamboo	*Dendrocalamus* spp.	19	5.3
Paiyu	*Prunus cerasoides*	6	1.7
Total		**356**	**100**

[1] Howell J (1999). Roadside Bio-engineering. Site handbook. Department of Roads, Government of Nepal.

3.5 Species selection

The choice of *amrisso* as the main plantation species has already been outlined in First Phase Report Section 6.3.2.2, page 46. In brief, the *amrisso* provides economic opportunities through the sale of brooms made from the flower heads for which there is a good market; its leaves are a palatable fodder and it is seen as a good vegetative cover for stabilising slopes against landslides. *Amrisso* is traditionally planted in the region by some farmers on their sloping land and terrace risers. Consequently, the RUGs chose *amrisso* for road side protection planting. Having multiple benefits and as a plant which is traditionally grown on such sites it also has the advantage of being well-known to local farmers, there is known to be an assured market for its products for cash incomes and it is an important livestock fodder.

3.6 Plantation action plan

The plantation action plan is given in Annex-3 covering programme activities beginning from orientation of the RUG and the municipality members up to plantation establishment in two sites and subsequent protection.

3.7 Availability of plantation materials (rhizome)

Amrisso is readily propagated from its rhizomes taken through division of an existing plant. As there is already a considerable amount of *amrisso* in the area, adequate planting material is assured. Contracts were made with a number of farmers, giving preference to those who are also members of the RUG, to provide the required quantity planting material. In total, 21 local suppliers including RUG members supplied the required number of *amrisso* saplings for plantation establishment.

3.8 Site clearance

Site cleaning is a crucial activity taking place before plantation establishment to remove weedy species that will compete for nutrition and light. This clearance was conducted shortly before the planting season started in July 2018. The effect of shade on *amrisso* growth was discussed with the RUG members and they realised there was a need to thin *utis* trees in the denser areas to increase the area for *amrisso* plantation and to minimise the negative effects of shade on *amrisso* growth.

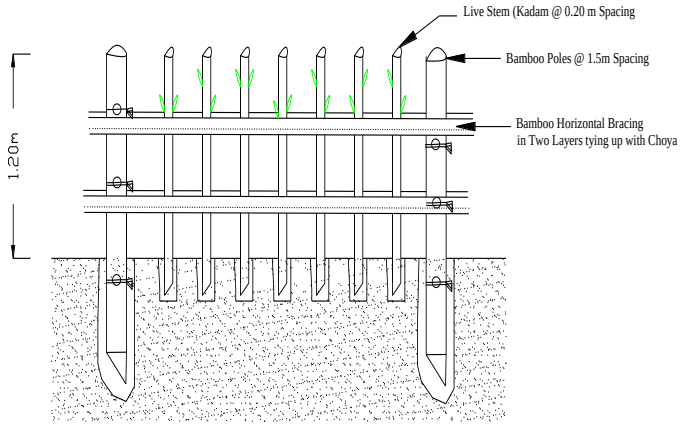
3.9 Compost management

The application of organic matter (animal manure or compost) is important to obtain rapid establishment and growth of *amrisso*. However, RUG households have no practice of manuring *amrisso* as they generally consider it as a low input crop, used only for domestic purposes (mainly fodder). To change this mind-set, compost-making trainings were organised in both pilot sites in which 35 user members participated. During this, compost making by utilising weeds and other unwanted shrubs e.g. *banmara* was demonstrated. The application of 1-2 kg of compost per planting pit was recommended to enhance the growth of *amrisso* with a further application of farmyard manure at the time of the first weeding after plantation establishment.

3.10 Fencing

The roadside area is open, and livestock graze freely along it. This means that there is a risk of browsing, particularly along the lower side of the road which is more accessible to livestock. Therefore, fencing was considered to be necessary to protect the planted *amrisso* during the early establishment period. Fencing was constructed by members of the RUGs using locally available materials (mainly bamboo poles). Only the area most vulnerable to livestock grazing were fenced – this amounted to 350 m at Site-1 and 1,000 m at Site-2 which has more grazing pressure. At Site-1 green fencing using jatropha (*Jatropha curcas*) branch cuttings planted into the ground was also used. Areas where there were existing retaining walls, rocks or that were otherwise not liable to grazing were not fenced. Details of the fencing are shown in *Figure 3*. The costs of fencing are shown in *Table 5*.

Figure 3: Fencing detail



3.11 Land preparation

After site clearance, removing of weeds and unwanted shrubs, planting pits measuring 1 cft (approximately 30 x 30 x 30 cm) at a distance of 1.5 m between rows were prepared shortly before planting. A total of 14,150 pits were prepared at both sites (see *Table 1*). As there was inadequate material for preparing compost before pitting took place, it will be applied during first weeding.

3.12 Planting

Amrisso saplings were planted into the prepared pits at both pilot sites during June 2018. At this time of year soil moisture is usually adequate as a result of pre-monsoon rains. A total of 6,090 *amrisso* saplings were planted at Site-1 and 8,060 saplings at Site-2. Although *amrisso* is fairly drought tolerant, due to the long dry period that took place immediately after plantation establishment, it was irrigated at 5-day intervals in the absence of rain to avoid excessive mortality. Normally, the monsoon rain would be adequate without additional watering. During the first year of establishment, the *amrisso* plants will be weeded at least three time to ensure optimal growth with annual weeding during subsequent years generally being adequate.

Table 4 shows how the number of plants required was calculated. Total plantation cost[2] is presented in Annex 2.

[2]As per our earlier plan, the estimated cost was considered only for site 1 in Dhankuta. When we selected another site as site no 2 in the same road section, the cost is increased. The abovementioned plan is of both sites and expenditure is as of October 2018. Some activities like training, meeting, weeding, manuring, watering etc are ongoing so the annex 2 will be updated periodically.
Note:1 GBP=143GBP

Table 4: Calculation of planting material for Sites 1 & 2

Length of Road (m)	Width of plantation area in left (m)	Width of plantation area in right (m)	Spacing of plant (m)	Effective area of Plantation- deducting existing coverage)	Number of Plant including both left and right
A	***B***	***C***	***D***	***E***	*= Ax(B-0.25-0.25+ C-0.25-0.25)/(DxE)*
1000 Site one	6.5	6.5	1.5	75.5%	6,090
2100 Site two	6.5	6.5	1.5	59.3 %	8,060

Table 5: Estimated and actual costs for fencing

DESCRIPTION	Site-1	Site-2
Actual cost for fencing	**£2141 (for 1,000 metres of fencing)**	**£207 (for 350 metres of fencing)**
Basic rate of fencing per meter length, NRs.	**£2.14**	**£0.59**

Note: Fencing cost was not estimated during the site selection, later we realized to have fence in some part of roads where there is chance for roaming the cattle.

Bamboo for fencing and Jatropha for the green barrier (live fencing) could not be found close to Site-1. Therefore, the cost was found to be little bit high due to the high transportation cost in the rainy season. Moreover, bamboo is also in demand for staking tomatoes by the local people which also raised the price at that site. At Site-2 bamboo was available at lower cost hence the cost per m was lower.

3.13 Risks

In this pilot study, the local municipality is expected to share some of the plantation cost. In particular, it is expected to fund regular road maintenance works, notably the re-excavation of the drainage ditches as well as in-filling potholes. Although the rural municipality has expressed their support for the project and a willingness to allocate funds for the road maintenance, this can only be budgeted in the next fiscal year. The risk is that other priority activities are raised during the municipal annual planning and budgeting process that “squeeze out” this pilot road project. In this regard, the research team is required to continuously maintain close contact with the rural municipality during their planning and budgeting process to ensure allocation of funds for basic road maintenance including maintenance of drainage and filling potholes.

Ownership of a rural agriculture road like the Hile-Chhintang road has not been clear until now. Under the new federal system, the future role of DoLI is not clear and the role of the provincial roads department has also to be defined. The former post of District Technical Officer who was working under DoLI does not exist anymore in the project area and there is an absence of technical support available for these roads

Annex-1: Details of vegetation along pilot road section in Hile-Chhintang road

SN	Nepali name	Scientific name	English name
1	*Bambo Jhyang*	*Dendrocalamus* spp.	Bamboo
2	*Chilaune*	*Schima wallichii*	Needle wood
3	*Khanayo*	*Ficus semicordata*	Fig
4	*Phusre*	*Grewia optiva*	Biul
5	*Siris*	*Albiizia morrs*	Siris
6	*Timur*	*Zanthoxylum armatum*	Winged prickly ash
7	*Uttis*	*Alnus nepalensis*	Alder
8	*Paiyu*	*Prunus cerasoides*, D.Don	Cherry
9	*Nebaro*	*Ficus auriculata*	Fig
10	*Amrisso*	*Thysanolaena maxima*	Broom grass
	Plantations		
1	Makai	*Zea maiys*	Maize
2	Golbheda	*Lycopersicon esculentum*	Tomato
	Weeds/bushes		
1	Sisnu	*Urtica diocea*	Nettle
2	Unyu		Fern
3	Banmara	*Eupatorium adenophorum*	Alder
4	Pani amala		Water amala
5	Titepati	*Artemsia vulgaris*	Artemesia

Annex-2: Details of Hile - Chhintang Road Plantation cost

(expenditure as of October 2018)

SN	Description	Unit	Quantity	Rate	Amount in NRP	Proposed for Sharing			Remarks
						By Community	By Local level / DoLI	By Project	
A	Hile - Chhintang Road Project Site Dhankuta								
1	Site Clearance, cutting and clearing bush and stacking	Sqm	32600	20	652,000	516,687	-	135,313	21% by Project and 79% by community
2	Site preparation /trimming slope, drains etc	Cum	975	350	341,250	-	-	-	100% by Govt (not done)
3	Road improvement with filling pot holes	Cum	213	2000	426,000	-	250,000	-	58% by Govt
B	Field preparation and plantation								
1	Digging holes for plantation	Cum	113.2	350	39,620	12,386	-	27,234	31% community
2	Purchase Broom grass saplings	No	14150	12	163,510	-	-	163,510	100% by Project
3	Plantation of broom grass	No	14150	3	42,450	13,563	-	28,887	32% community
4	Weeding	PD	520	500	260,000	64,320	-	92,800	60% by the Community
C	Irrigation support with pipes								
1	HDPE Pipe 20 dia 100m role 5 no	Rm	500	60	30,000	-	-	33,561	by Project
D	Low cost Fencing with local stems towards valley side only								
	Fencing	Rm	1350	270.51	365,188.50	30.013.50	-	335,175	8% by community
E	Fertilizer support	Kg	-	2	41,600	20,025	-	21575	48% By Community
F	Training support								
1	Compost preparation	Event			10,000	-	-	3,000	2 days
2	Business support service	Event			15,000	-	-	7,495	3 days
3	Training facilitator cost	LS			40,000	-	-	42,565	
4	Tools and Plants	LS			10,000	-	-	1,900	
5	Coordination meeting with *Palika* and user committee	No	12	5000	60,000	-	-		
	Total				2,496,618.50	656,974.50	250,000	889,440	

Annex-3: Road Site Plantation Action Plan

SN	Detailed activities	Time frame	Responsibility
1	ReCAP programme orientation to local governments and beneficiary households	Last week of July 2017	ReCAP research team
2	Identification of beneficiary households	1st week of November 2017	ReCAP research team
3	User group formation	1st week of November 2017	ReCAP research team
4	Action plan preparation by user groups	1st week of November 2017	User group members
5	Site verification and in-depth discussion on plantations, plant materials	1st week of November 2017	User group members/ ReCAP research team
5	RoW potential area measurement	1st week of November 2017	ReCAP research team
6	Plant identification, observation	1st week of November 2017	ReCAP research team
7	Area verification and detail discussions with user committee members	2nd week of February 2018	CD, Programme coordinator
8	Agreement between user committee and user committee Rural Municipality	Last week, March 2018	User group/Municipality chair person
9	Training on *amrisso* cultivation, management and improved compost making training	4th week of March 2018	ReCAP research team
10	*Amrisso* propagation material identification and management	4th week of March 2018	User group members/ ReCAP research team
11	Manure management	2nd week of April 2018	User group members
12	Fencing	2nd week of May 2018	User group members/ ReCAP research team
13	Site clearance (bushes, weeds)	2nd week of May 2018	User group members
14	Pit preparation, manuring	2nd week of June 2018	User group members
15	Planting	4th week of June 2018	User group members/ ReCAP research team
16	Watering for young rhizome when necessary based on dry condition after plantations	July 2018	User group members
17	Weeding, watering and manuring	Three times year	User group members
18	Plant growth monitoring, disease treatment and UC backstopping	Continue	Users groups members and research Team
19	Plant growth monitoring, disease treatment and UC backstopping		Users groups members and research Team
20	User group second training on fire	Oct 2018	Users Groups and

SN	Detailed activities	Time frame	Responsibility
	protection, composting and market linkage		research Team
21	User group exposure visit	Oct 2018	Users Groups and research Team
22	Monitoring of the road slope sides together with municipalities	Oct 2018	Municipality/ Users Groups and research Team
23	Harvesting and selling product	Sept /Oct 2019	Users Groups and research Team