

Chapter 7 Farmland Use Plan

7.1 Objectives and procedural outline

7.1.1 Objectives of farmland use plan

The objective for introducing the Farmland Use Plan (FUP) is to offer the groups and their members a tool that would allow them to make and implement a mid- to long-term plan for the rational and sustainable use of their farmland, thereby contributing to environmental conservation and improving their farm's productivity and profits.

Making the FUP is identified as an urgent activity in the Initial Activity Plan of a newly formed group (See Chapter 6) and should be done immediately after establishing the group farmland. The FUP consists of the following elements¹:

- Element 1: General information about the farm
- Element 2: Map of current land use
- Element 3: Map of future land use
- Element 4: Estimate of necessary inputs and work schedule

The FUP is also part of a larger “group action plan”, which summarizes the group's vision for development with a broader perspective covering not only the use of the farmland, but also other social or economic activities.

The difference between the FUP and the Annual Activity Plan (AAP), which sets more specific and detailed short-term actions of each group, is explained in Chapter 12.

7.1.2 Procedural outline

The FUP is made according to each group's advancement, as shown in the Figure 7-1, for group farmlands as well as individual farms.

¹ It is understood that the concept of Farmland Use Plan as presented in this Guideline is wider than that of “Farmland Management Plan” which is considered for Chagres National Park. The Resolution AG-0259-2009 of the ANAM, “which adopts the Farmland Management Plan in the Special Use Zone, as management tool for the conservation in the Chagres National Park, and defines other dispositions”, establishes the minimum contents and procedures for approval of Farmland Management Plan. In the context of Chagres National Park, both terms are practically equivalent.

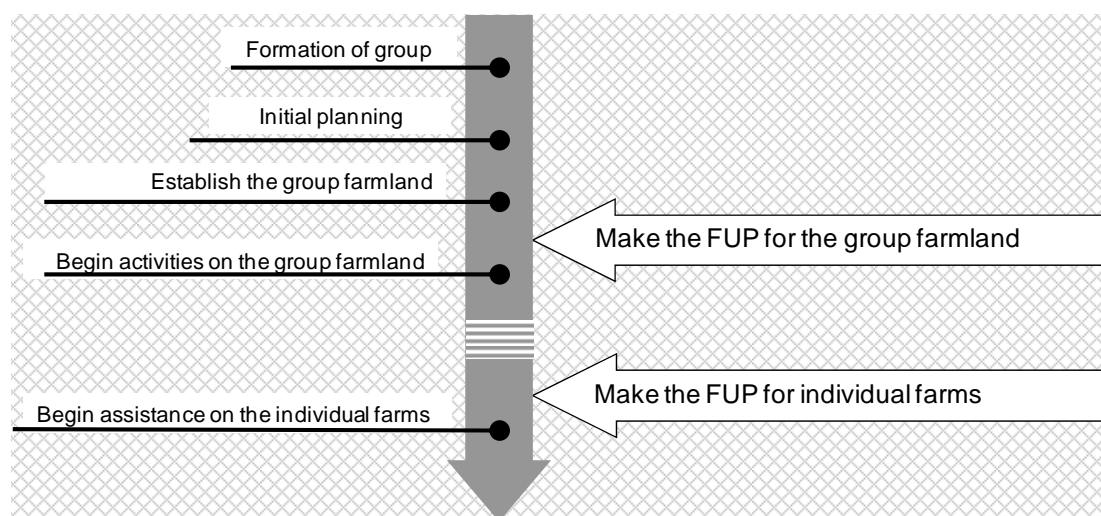


Figure 7-1 Outline of making farmland use plan

After confirming the initial activity plan and establishing the group farmland, you can explain the concept of the FUP to the farmers at the group farmland so they can participate in its creation. The FUP needs to be made without delay before the group starts planting crops or doing conservation activities.

When the group has reached a sufficient level of maturity and fulfills the requirements for advancing to the second phase of receiving assistance on members' individual farms (see Chapter 13), a FUP needs to be made for each individual farm. The project's technical personnel help in this process.

7.2 Methodology

A FUP for a certain farm can be made through the following process (see Annex 3 for available guidelines and manuals on the methods of farmland planning):

- Step 1: Discuss with beneficiaries, collect general information, make a tour of the farm
- Step 2: Measuring and making a map of the current land use
- Step 3: Dividing the farmland and applying the land use criteria
- Step 4: Make a map of the future land use
- Step 5: Estimation of inputs needed and creation of work schedule
- Step 6: Final confirmation of the FUP

A "farm" is usually considered to be a "unit for farm production", but its form can vary. In some cases a beneficiary (farmer) may have various separated pieces of land where he/she is working simultaneously and considers them as one farming unit. This segment of land within a farm is referred to as a "plot" in this Guideline.

There are various uses for the farmland including agriculture, livestock and forestry use or a mixture of these (agricultural and livestock farming, agroforestry or silvopastoral use). The farm also includes the farmer's house and surrounding yard and fallow lands. Secondary forests and grass fields (area covered by canal grass) that develop after clearing land that had been farmed before (these could also be considered fallow land) are also considered to be part of the farm as long as the owner or user has the intention of farming them in the near future. Once a land has been definitely abandoned it is no longer considered to be part of the farm.

7.2.1 Step 1: Discuss with beneficiaries, collect general information, make a tour of the farm

1) Discussing with the beneficiary

The project's technical personnel begin the process of making the FUP on his/her first visit to the beneficiary. He/She explains the concept of the FUP and its importance to the beneficiary (which would be a group in the case of a group farmland or a family in the case of an individual farm). It would be helpful to show a FUP from another farm to help the beneficiary understand its concept. The following points should be communicated:

- The main purpose of a FUP is to implement environmental conservation on a farm, and is not a plan for only developing farm production. Therefore, the project will not be able to accept all the activities or investments the beneficiary may desire if these are not compatible with environmental conservation.
- The duration of a FUP is for about 3 to 5 years. At the time of making the FUP, the details of all the future investments still do not have to be decided because the FUP is a medium to long-term master plan for the farm.
- The creation of a FUP does not guarantee financial aid nor support of materials for implementing the planned investments, when there is no financing source like projects. However, the FUP helps to clarify which investments need to be made by the beneficiary and which may be provided by the project.

2) Collecting general information

Use the pre-established format (see Annex 1) to collect the general information about the farm, such as the name of the community and beneficiary, the coordinates, surface area, etc. Other information can be added according to each project's needs, these may be the socioeconomic data about the beneficiary, location in a political map, access roads, geographic relation to the sub-watershed and protected areas (if any), land ownership, etc.

Reading GPS coordinates requires configuring the datum, whether it is the WGS 84 or another datum appropriate for the region. Find an open area inside the farm, preferably a fixed point on something immobile, and wait until you obtain an acceptable range of precision.

3) Making a tour of the farm

The project's technical personnel make a tour of the land together with the beneficiaries in order to confirm its boundary and the conditions of neighboring lands. While touring the farm, take note of its general features (its shape, size, topography, vegetation, current use, water bodies, man-made structures, etc.) and make an approximate drawing of the farm (Figure 7-2). Identify and number the "points of reference"; these will be useful when making measurements in the next step.

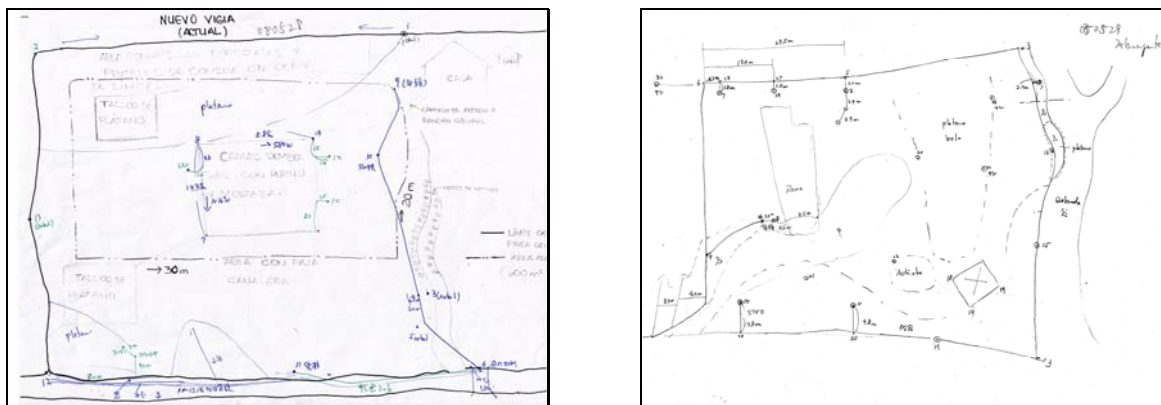


Figure 7-2 Examples of drawing of farm

The points of reference should be permanent or immobile objects, such as man-made structures, trees, water bodies, road, corners of the farm, etc. In addition, it is especially important to indicate the boundaries between different vegetation and current crop areas, and also the conceptual lines where the land slope changes abruptly.

During this process, it should be explained to the beneficiary that this activity has nothing to do with the issue of land tenancy because property rights is a sensitive and complicated issue. We recommend that the walkthrough be limited to the pertinent farmland and to not include other lands that may also belong to the beneficiary. The project personnel should be careful not to create false expectations or conflict among farmers regarding this issue.

In the case that there already are conflicts about land demarcation or land-use rights between neighboring farms or between the beneficiary and the authorities, you should first obtain written legal documents to clarify the situation. However, you should not intervene too deeply into the conflict because the normalization of property rights (ownership, usufruct, lease, etc.) and land borders is not an issue that pertains to any particular project, but to the authorized institutions. A footnote should be placed on all the maps produced by the project, stating the following: "This map does not guarantee the legal validity of the demarcation or ownership of the land. The map was made based on information provided by the beneficiary."

7.2.2 Step 2: Measuring and making a map of the current land use

The current land-use map of the farm should correctly depict its shape (borders), area, terrain, vegetation cover or crops, bodies of water, roads, trees, human made structures and GPS coordinates. A bar scale, north arrow and date should also be indicated on the map (See Figure 7-3).

The most important elements are the slope and vegetation cover (or crops) of the plots. The division of the farmland according to changes in slope or vegetation cover is drawn onto the map as conceptual lines. Each project should decide on its criteria for classifying the slope gradient and vegetation type. (In the case of Alhajuella Project, 4 gradients of slope and 4 types of vegetation were chosen.) The slope gradient can be estimated by eye or measured with different types of equipment (clinometer, altimeter, tape measure and level, etc.), but all the project technicians should unify beforehand the methodology that will be used.

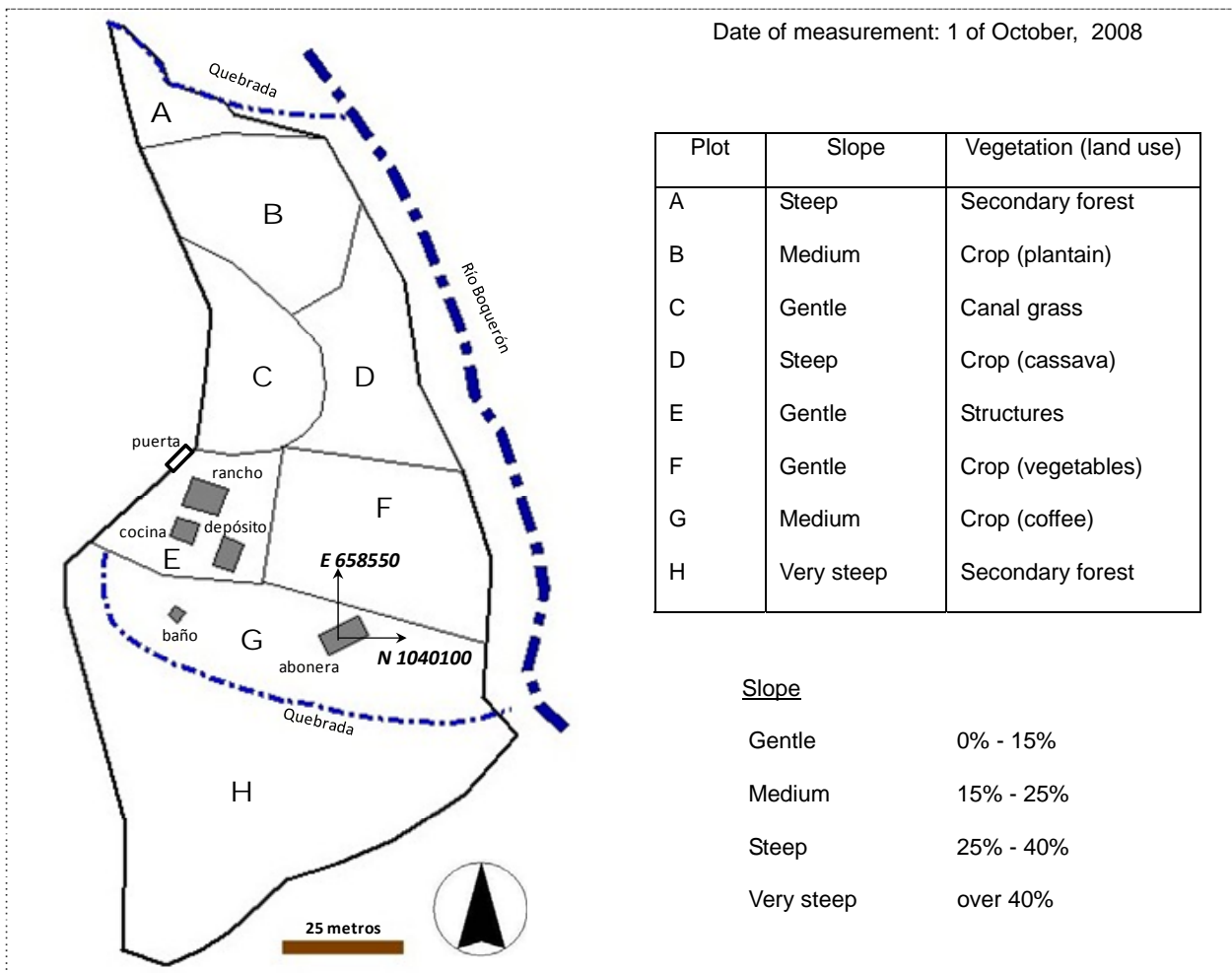


Figure 7-3 Map of current land use (example of a group farmland of Alhajuella Project)

Table 7-1 gives a summary of different land survey methods, of which we would recommend surveying with GPS and surveying with tape measure and compass (see the Annex 7.1 for the detailed processes).

The applicability of surveying with aerial photos or satellite images is relatively limited because the borders of the farms are not physically marked and cannot be identified from great distances. They need to be verified on site; likewise the slope of the terrain must also be confirmed on site. (Unless a digital elevation model of the area already exists.)

Table 7-1 Land survey methods

Method	Advantages	Disadvantages
Surveying with GPS	It is relatively quick and precise and produces a georeferenced product	Requires knowledge of how to use the GPS and the GIS program. Results are affected by the quality of the signal.
Surveying with tape measure and compass	It is a simple and adequate method for small agricultural farms.	It is difficult to apply to large farms because it is a slow process with a relatively large margin of error.
Surveying with aerial photos or satellite images	It is an approximate method and is appropriate for cattle farms with clearly marked borders.	The area images need to be obtained from an outside source. The slopes and some borders need to be verified on site.

7.2.3 Step 3: Dividing the farmland and applying the land use criteria

The project’s technical personnel explain how to read the map to the beneficiary, and based on this, practice an exercise of planning the future land use of the farmland.

1) Dividing the farmland

The division of the farmland into plots is done according to the current vegetation or land use and the slope, establishing 3 types of areas, namely (1) area for conservation, (2) area for structures, and (3) potential area for farming. The area for conservation also includes those areas that need the restoration of their vegetation cover (so-called “critical areas”).

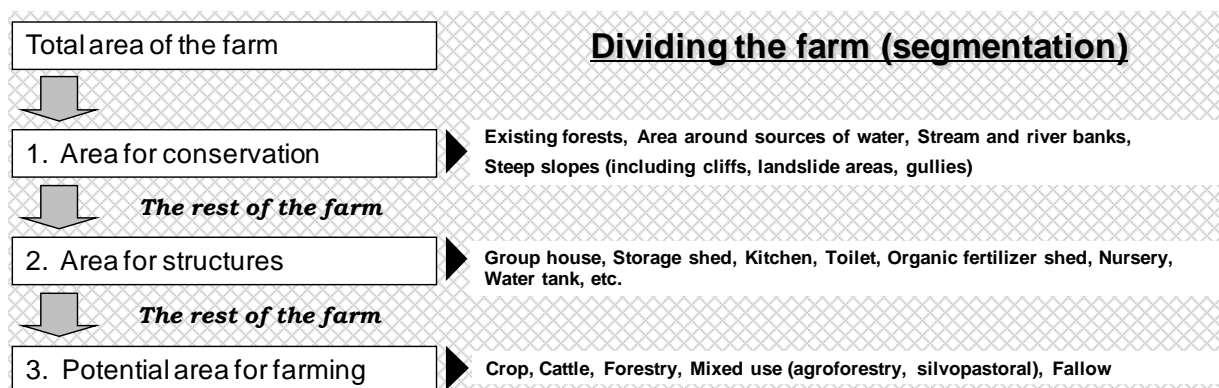


Figure 7-4 Dividing the farm (segmentation)

Normally, the land segmentation is more detailed on agricultural farms than on cattle farms. This is because the conservation and environment-friendly techniques that will be introduced differ substantially between crop farming and extensive cattle farming. In both cases, the land division (segmentation) should be neither excessively detailed nor too simple in order for the FUP to be a useful and practical tool.

2) Applying the criteria of land use

To define the area for conservation, apply the conservation criteria (Table 7-2) which are based on the Forestry Law and other legal norms such as the “Chagres National Park Management Plan” in case of Alhajuela Project. The production use criteria (Table 7-3) for the potential area for farming is applied in order to help select the appropriate crops to be planted and the conservation techniques to be introduced in each plot. It would be recommendable to make a tour of the farmland again with the beneficiary while reading the map on site and discussing the future uses of the farmland.

Table 7-2 Conservation criteria

According to the Forestry Law , the following lands should remain as forest or be reforested.		
Areas around a water source	(On hills)	A radius of 200 meters in the case of natural forests A radius of 100 meters in the case of planted forests
	(On level ground)	A radius of 100 meters in the case of natural forests A radius of 50 meters in the case of planted forests
Banks of streams and rivers	A strip on each side as wide as the river, or not less than 10 meters.	
According to the Chagres National Park Management Plan , the following activities are permitted on sloped lands.		
Sloped lands (S = Slope)	$S > 40\%$	Must be conserved without any activity.
	$40\% > S > 25\%$	Only <u>agroforestry</u> activity is permitted
	$25\% > S > 15\%$	<u>Agroforestry</u> and <u>cattle farming</u> activities are permitted
	$5\% > S$	<u>Agroforestry</u> , <u>cattle farming</u> and <u>agricultural</u> activities are permitted

In case of a group farmland, the crops and techniques to be introduced should be determined based on the preliminary visit and interview on the situations of the members' individual farms, because techniques that are not applicable on the individual farms or that are not new to the group members will be given less priority among the techniques practiced on the group farmland.

Table 7-3 Production use criteria

Current land use		Recommended future use	Applicable Techniques Applicability: (+++) very high, (++) high, (+) average	
Slope	Slope			
Gentle 0% - 15%	Forest	Forest	Preserve the existing forest	
	Canal grass	Forest	Plant trees	
		Crop production / Agroforestry	Reduce the Canal grass; Agroforestry cultivation under the shade of trees / Taungya	
		Livestock	Silvopastoral system	
	Production use (crop, livestock)	Crop production / Agroforestry	(+++) (++) (+)	Level planting or planting along the contour line Erosion barriers; Alley cropping Terraces; Drainage ditches; Vegetation cover; Agroforestry cultivation under the shade of trees / Taungya system
		Livestock	Silvopastoral system	
Medium 15% - 25%	Forest	Forest	Preserve the existing forest	
	Canal grass	Forest	Plant trees	
		Agroforestry	Reduce the Canal grass; Agroforestry cultivation under the shade of trees / Taungya	
		Livestock	Silvopastoral system	
	Production use (crop, livestock)	Agroforestry	(+++) (++)	Erosion barriers; Alley cropping; Vegetation cover Level planting or planting along contour lines; Erosion barriers, Terraces; Drainage ditches; Agroforestry cultivation under the shade of trees / Taungya system
		Livestock	Silvopastoral system	
Steep 25% - 40%	Forest	Forest	Preserve the existing forest	
	Canal grass	Forest	Plant trees	
		Agroforestry	Reduce the Canal grass; Agroforestry cultivation under the shade of trees / Taungya	
	Production use (crop, livestock)	Agroforestry	(+++) (++) (+)	Level planting or planting along the contour line Erosion barriers; Alley cropping Terraces; Drainage ditches; Vegetation cover; Agroforestry cultivation under the shade of trees / Taungya system
Very steep Over 40%	Forest	Forest	Preserve the existing forest	
	Other	Forest	Plant trees	

The land use capacity (classes I to VIII) could be a useful reference for the selection of crops and techniques, if

the soil analysis data are available.

The selection of which crops to introduce in the plots depends basically on the beneficiary’s intentions. However, the project’s technical personnel should give his/her technical suggestions to achieve more favorable results both for the environment and for the farmer’s economy. In the FUP, the crops can be categorized as annuals, perennials, tubers, trees, etc. and do not have to be identified by their specific variety. They may also be expressed as “various vegetables”, “fruit trees”, “3 year rotations”, etc. because more details will be decided each year in the Annual Activity Plan (see Chapter 12).

7.2.4 Step 4: Make a map of the future land use

The map of future land use represents situation of the farmland in the future as discussed and agreed upon between the beneficiary and the project’s technical personnel (see Figure 7-5).

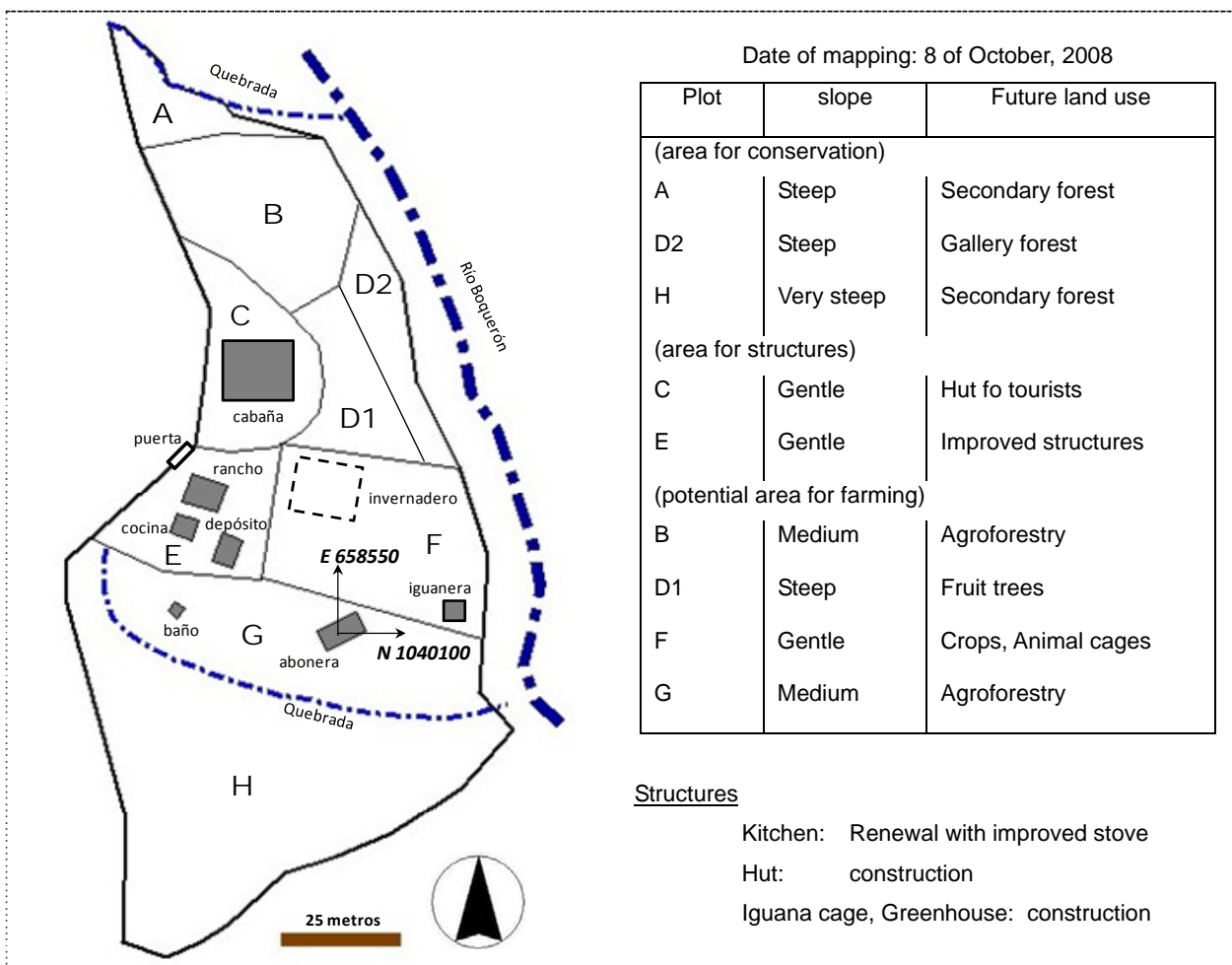


Figure 7-5 Map of future land use (example of a group farmland of Alhajuela Project)

In order to help the farmers understand the demarcation of plots on the farm, it would be recommendable to give an easy to remember name to each plot and to mark them physically with signs.

7.2.5 Step 5: Estimation of inputs needed and creation of work schedule

The estimation of necessary inputs for implementation of FUP is summarized in a table, together with general work schedule (Table 7-4). Also, it should include the beneficiary's own contribution, outside support and the proportion of harvests to be sold.

Table 7-4 Summary sheet (example of a group farmland of Alhajuela Project)

Plots	Future Use	Specie or Variety	Quantity	Conservation Techniques	Work Schedule			Inputs from the owner	Inputs from outside	% for sale
					Year 1	Year 2	Year 3 -			
(area for conservation)										
A 350 m ²	Secondary forest	Native species	-	Taking care of forest	-	-	-	-	-	-
D2 100 m ²	Gallery forest	Native species	10 trees	Plant trees	Prepare the seedlings	Plant the seedlings	Take care of trees	Seedlings	-	-
H 1,000 m ²	Secondary forest	Native species	-	Taking care of forest	-	-	-	-	-	-
(area for structures)										
C 300 m ²	Hut for tourists	-	1 hut	-	Obtain materials	Obtain materials	Construct hut	Sand; Labor	Other materials	-
E 250 m ²	Group house, Kitchen, Storage shed	-	1 improved stove	-	Widen the kitchen	Construct improved stove	-	Sand; Cement	Other materials	-
(potential area for farming)										
B 1,150 m ²	Agroforestry	Plantain, Native trees	100 seedlings	Agroforestry, Terraces, Live barriers	Harvest current crops	Build terraces and barriers, plant plantain	Care, harvest, replanting	Seedling; Timber	Vetiver	20%
D1 160 m ²	Fruit trees	Grafted orange	10 seedlings	Green fertilizer (<i>arachis pinto</i>)	Harvest current crops	Plant arachis, incorporate it into soil	Plant oranges	Seed of arachis	Seedlings of orange	50%
F 600 m ²	Annual crops, Animal cage	Vegetable, Iguana	10 oz. of seed, 8 iguanas	Cropping in greenhouse, Animal cage	Construct greenhouse and cage	Planting, care, harvest	Planting, care, harvest	Timber; Iguana; Labor	Seed; Net; Wire	80%
G 600 m ²	Agroforestry	Coffee, Pepper, Native trees	Increase 30 units of coffee & pepper	Agroforestry under shade	Plant additional coffee & pepper	Care, harvest, replanting	Care, harvest, replanting	Coffee	Pepper	80%

- In the case of Plot D1 (160 m² of area with a medium slope and currently planted with cassava), the group decided to convert it into an orchard.
- The group chose grafted orange. The number of seedlings is estimated to be 10.
- For conservation and enrichment of soil, green fertilizer (*arachis pinto*) will be planted.
- A work schedule was made for the approximate stages. In Year 1, the existing cassava will be harvested; in Year 2, *arachis pinto* will be planted and incorporated into soil; in Year 3 the orange seedlings will be planted.
- The group can provide seed of arachis, while the project will provide orange seedlings. The percentage of harvest to be sold was estimated to be 50%.

Based on the summary sheet of FUP, the inputs and activities will be planned more in detail in the Annual Activity Plan (AAP).

It is important to remember that the planning often becomes ambitious resulting in a workload that is beyond the beneficiary's capacity to carry out. To avoid such situations, the project's technical personnel and the beneficiary should have correct knowledge about the different crops, such as the farming calendar (sowing and harvest seasons), proper crop management techniques, expected yields, laborers needed and their availability, and the type and amount of materials that will be needed. There should also be a database of the unit prices and suppliers of the different materials, which should be updated regularly. See the Annex 7.1 for some restricting factors that should be taken into account when planning the future use of the farmland.

7.2.6 Step 6: Final confirmation of the FUP

The exercise of making a FUP ends with its final confirmation by the beneficiaries. In the case of individual farms, the farmer (representative of the family) signs two copies of the FUP, one for the beneficiary and the other for the project. In the case of a group farmland, the project's technical personnel should hold a session with the group members to explain the maps that were made and the summary chart. Once the group members arrive at a consensus, the group president signs the two copies of the FUP and one copy stays with the group.

Given that the FUP is only a documental guideline and does not have any binding force for its implementation, the project and beneficiary should discuss, during the process of making the FUP, a mechanism that would guarantee the fulfillment of the FUP, especially in the case of a FUP for a group farm. One idea is to give some incentive to the beneficiary to fulfill the FUP and a disincentive for its non-fulfillment.

As a principle, the FUP is not given frequent modifications once it has been confirmed. In case of group farmland, it is essentially important that the members build unanimous consensus to avoid frequent changes of the plan during its implementation. If the FUP must be revised it should be done by the joint participation of the beneficiary and project personnel, and the modifications will again have to be confirmed by group consent.

7.3 Digitalization of the FUP and its integration to the GIS

In order to achieve the integrated management of a watershed (and accomplish the management plan for a protected area, if any), all the information in the FUP of each farm should be digitalized and integrated into the GIS (Geographic Information System) managed by ANAM. The specific benefits of doing this are as follows:

- Georeference the farm's location on the base map.
- Facilitate the geometric analysis of the farm and the depiction of its attributes on different layers.
- Produce thematic images with greater clarity according to the needs of the users.
- Establish a scientific base for all the actors involved in the management of the watershed.

To georeference the farm on the base map (raster image) the following 2 steps are taken:

- (1) Establish the UTM coordinate axes on the scanned image of the base map. There are various free software available on the Web, such as *HyperCube* (© USATEC, 2008).
- (2) Localize ("mount") the location of the farm according to its coordinate, in form of point or polygon. This process differs by the method of survey: in case of survey with GPS, georeferenced maps are produced using GIS programs (*ArcGIS* © ESRI, *Forestry GIS* © University of Wisconsin, etc.). In case of manual survey, it is necessary to establish the UTM coordinate axes on the manually produced maps and convert them into files which are compatible with GIS.

Once georeferenced and localized on the base map, GIS allows to produce different layers of spatial information of the farm in the form of polygons, polyline or points (vector data), such as division of the farm, man-made structures, trees, streams and roads (see Figure 7-6). Also, it is possible to establish a link between the layer of spatial information and its attributes (for example, the name of the landowner, crops, classification of the slope, photograph of the farm, summary sheet of the FUP, etc.)

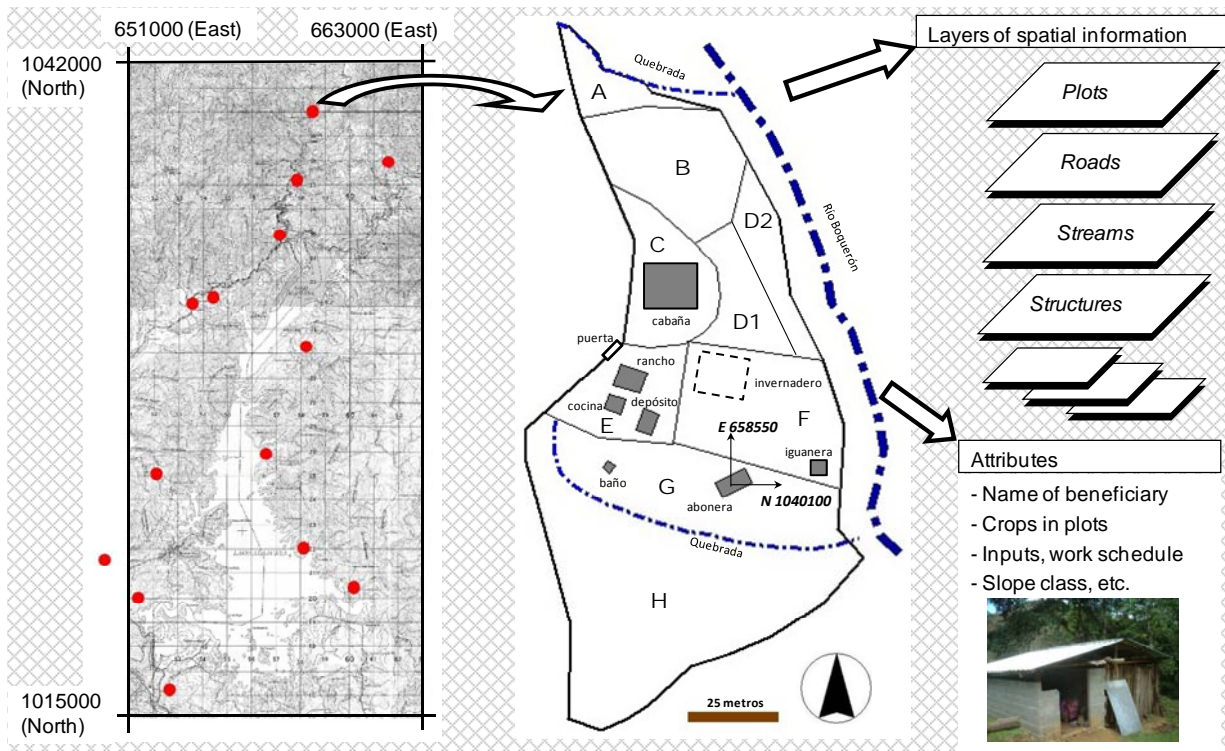


Figure 7-6 Integration into GIS and its utilization

In the case of cattle farms, the map is usually made on a smaller scale and the techniques to be introduced (silvopastoral system) are shown in a relatively simple manner (see Figure 7-7). Regarding the integration of the FUP's into the SIG, it is important to include both the agricultural farms and the cattle farms because each causes different types of impacts on the watershed environment.

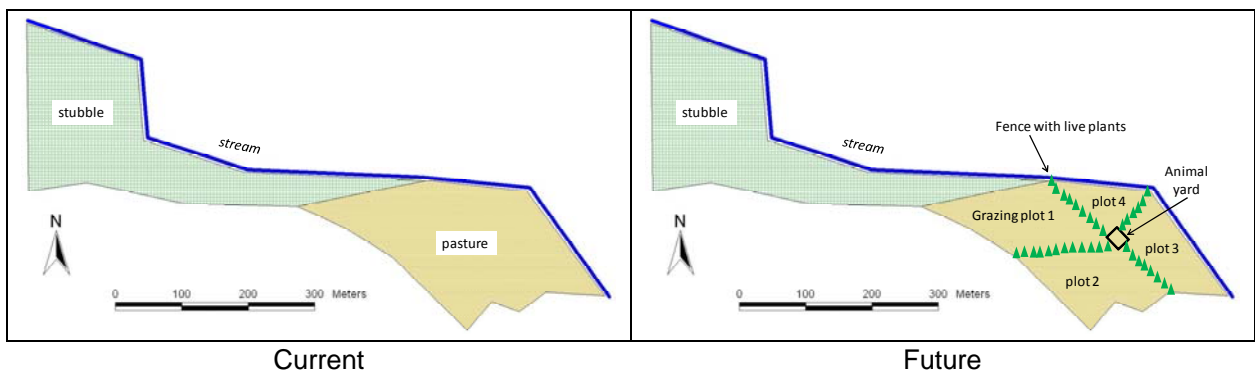


Figure 7-7 Maps of current land use and future land use of cattle farm

The FUP model could vary among the different institutions and projects, and also due to the geographic relationship of a farm to protected areas. However, the most basic 4 elements (1. general information; 2. current land use map; 3. future land use map; 4. Summary of needed resources and work schedule) will apply to all FUP

models. Each project should determine the minimum contents, optional contents and formats to use for its FUP's.

7.4 Inputs needed

The chart below shows the inputs needed for making a FUP for a relatively small agricultural farm, based on the experience of Alhajuela Project.

Activity	Personnel	Time	Material and Cost
Discuss with beneficiaries, Collect general information, Make a tour of the farm	1 technical personnel; Beneficiary(ies)	1 day	Nothing special
Measuring and making a map of the current land use	<u>Survey with GPS</u> 1 technical personnel; Beneficiary(ies)	1 day	GPS
	<u>Manual survey</u> 1 technical personnel; 1 to 2 assistant; Beneficiary(ies)	1 day for 1 ha. (could vary)	Tape measure, Compass, Clinometer
	<u>Graphic process</u> 1 technical personnel	1 day	GIS program or Squared paper and Protractor
Dividing the farmland and applying the land use criteria	1 technical personnel; Beneficiary(ies)	0.5 day	Copy of the map of current land use
Make a map of the future land use	1 technical personnel	0.5 day	Copy of the map of current land use
Estimation of inputs needed and creation of work schedule	1 technical personnel; Beneficiary(ies)	1 day	Copy of the map of future land use
Final confirmation of the FUP	1 technical personnel; Beneficiary(ies)	0.5 day	Complete FUP

* Common utensils and the cost of transportation, food and refreshments are not included.