



Global Advanced Research Journal of Agricultural Science (ISSN: 2315-5094) Vol. 6(2) pp. 039-056, February, 2017
 Issue. Available online <http://garj.org/garjas/home>
 Copyright © 2017 Global Advanced Research Journals

Full Length Research Paper

Improvement, Rehabilitation and Productive Management of High Andean Prairies in the Province of Churcampa - Huancavelica, Perú

Fernán Cosme Chanamé Zapata^{3*}, Glodoaldo Álvarez Oré¹, Kenny H. Velásquez Tristán¹, Waldimar Pérez Torres², Arturo Rubelo Cárdenas², Juan Carlos Velásquez Mantari², James Ramos Medina², Carmen Turco Navarrete², Saúl Espinoza Molina³

¹Regional Government of Huancavelica, Churcampa Sub Regional Management

²Technical Team Responsible for Project Execution

³Technical Team Responsible for the Publication



Accepted 29 January, 2017

Objective: To systematize the experiences of the Project: "Improvement, Rehabilitation and Productive Management of High Andean Prairies in the Province of Churcampa - Huancavelica". **Methods:** The field work began with a visit to the 14 sites and their respective communities intervened by the project, then the respective programming was carried out for the development of the corresponding activities in each site. For the location of the corresponding parcel, the thematic map of vegetation of the micro-basins was used, and with the help of the project managers, the respective sites were located. On the other hand, by using GPS the sampling zones were georeferenced for their respective location of the parcels making use of the ArcGis software, the equipment also allowed us to locate ourselves through the coordinates in the corresponding parcels of evaluation. **Results:** The reinforcement for prairie management, implementation of soil conservation practices, construction and rehabilitation of infiltration ditches, repopulation of natural pastures by cuttings, production of pasture grown in rainfed land, assessment of the range of cultivated pastures, determination of the yield of green fodder, the closure of pastures with livestock mesh, evaluation of natural pastures, afforestation at the head of micro-watersheds, forest plantations in silvo pasture, forest plantations in living fences, plantation management, underpinning of plantations and strengthening of capacities at the community level and training of promoters. **Conclusions:** It was possible to systematize the experiences of the Project "Improvement, Rehabilitation and Productive Management of High Andean Prairies in the Province of Churcampa - Huancavelica".

Keywords: improvement, rehabilitation, productive management, Andean highlands.

INTRODUCTION

The high Andean areas of the Huancavelica region made up of small communities, were the most affected areas by political violence and during the last decades are also affected by adverse climatic factors such as cold, drought, frost, landslides, etc. as a consequence of climate change and the greenhouse effect that has been occurring in recent years. These areas are headwaters of micro watersheds, potential areas for natural resource management work such as soil conservation and sowing and water retention, management of high Andean prairies, reforestation and others within the basin management approach.

From the upper parts of the province of Churcampa lagoons, water fountains (puquios) and springs are born, the same ones that give origin to the streams and rivers of Tullpachanca that feeds of water for human and agricultural consumption to the province of Churcampa, creek Pururo that is located in the Cosme sector that feeds on water for agricultural purposes and the Huanchuy creek that also feeds for agricultural purposes and other small streams that feed water especially the lower parts. On the other hand, high Andean vegetation fulfills important functions in the hydrological cycle, food for livestock, resource to roof houses "huts", habitat for wildlife, etc.

According to the diagnosis and corresponding analysis carried out to formulate the project "Improvement, Rehabilitation and Productive Management of High Andean Prairies in the Province of Churcampa - Huancavelica", it has been determined that the natural prairies of this sub-basin are in the process of degradation. In this sense, the Praderas project has been implementing measures of adaptation to climate change within the project, which has been implemented since February 2014 until today.

On the other hand, the evaluation of pastures seeks to establish the situation of use, through qualitative and quantitative changes of the sites intervened by the project and management of the existing natural vegetation, as well as their environmental implications that will serve as a basis for an improvement plan of management that allows to improve the current state of the natural resources of the communities in which we are working.

According to ONERN (1984), the total area of the department of Huancavelica covers an area of 2'107 896 ha out of this total, 35% represents coverage of high Andean natural pastures with temperatures of 2 ° C and 12 ° C and annual precipitation of 500 to 1000 mm, which support a variety of cattle ranching, such as South American camelids (alpacas and llamas), sheep and cattle,

these areas of natural pastures (prairies) are currently degraded mainly by overgrazing, as well as by the lack of knowledge of the mixed family farming, use of a traditional breeding technique with low production and productivity, little adoption of new techniques and weak organization of producers.

Within the scope of the project, some local governments, ONGs and Agro Rural have been working for years on the recovery of degraded pastures, work characterized by the implementation of small areas (10 ha in average) with regard to the great extension of areas of natural pastures that exist in the province, obtaining satisfactory results recognized by organisms such as FAO, World Food Program and other institutions.

The regional government of Huancavelica has the mission of organizing and conducting regional public management according to its exclusive competences, shared delegates, within the framework of national and sectoral policies, in order to contribute to the integral and sustainable development of the region; so in accordance with the Concerted Plan and petitions of the beneficiaries and/or authorities, the Project for Improvement, Rehabilitation and Productive Management of Highland Prairies in the Province of Churcampa - Huancavelica was executed, where the sub regional management of Churcampa took appropriate actions within its competences, setting up the following objectives:

- Strengthen the capacities in practical theoretical events to raise awareness of problems, alternatives for recovery and management of natural prairies.
- Construct infiltration
- n ditches for the purpose of planting and harvesting from rainwater.
- Plant palatable natural pastures for animal feed and recovery of natural prairies and water retention through the vegetable mattress.
- Install cultivated pastures at the edges of the infiltration ditch to harvest water and increase animal carrying capacity.
- Evaluate the closure of degraded natural prairies and their recovery impact on environmental management.
- Promote the protection of soil and watersheds.
- Determine the effect and environmental benefit of forest plantations insilvopasture.
- Strengthen the training of community leaders and promoters on environmental resource management and community management.

*Corresponding Author's Email: fernan_chz@hotmail.com

MATERIAL AND METHODS

Location of the study area

In the Huancavelica region, Churcampa province, the Pururomicrobasins of the Cosme district are located, the Manzanayocmicrobasin of the Anco district, the PucutoArma micro basin of the El Carmen district, the Ccotccoymicrobasin of the Locomroja district and Churcampa, the Chontamicrobasin of the district of San Pedro de Coris and Paucarbamba, Layanpatamicrobasin of the district of Chichihuasi, micro-basin Millpo Occoro of the district of Chinchihuasi, all the rivers and streams are tributaries of the river Mantaro. The sites are located in the communities of Orcumpi, Chilcapata, Pantuylla, Cotay, Socos, Occoro, Los Andes, Tullpacancha, Oxapata, Chonta, Vista Florida, Huachuapampa, Lechuguillas and Millpo, at altitudes varying from 3614 to 4350m.a.s.l.

Materials and equipment

Materials: map of parcel location, map of areas of life with micro basins, self-retracting tape measure, censor ring, straight shovel, clipper scissor, field dial, polythene bags, notepad, newsprint, stationery (various)

Equipment: GPS, digital balance, camera, ArcGis software, laptop, printer.

METHODOLOGY

Execution of project components

Fieldwork began with the visit to the 14 sites and their respective communities intervened by the project, according to the systematization of experiences, then the respective programming was carried out for the development of the corresponding activities in each place.

For the location of the corresponding parcels, the thematic map of vegetation of the micro-basins was used, and with the help of the project managers, the respective sites were located. On the other hand, using GPS the sampling zones were georeferenced for their respective location of the parcels making use of ArcGis software, the equipment also allowed us to locate ourselves through the coordinates in the corresponding parcels of evaluation (Figure 1). In the field work consisted of the following:

Strengthening for prairie management

This activity was carried out through training in the different techniques of recovery of prairies, management of high Andean prairies, management of natural resources and training in community organization and management, in a total of 06 events of each one, with slides and other materials according to the cultural level of the beneficiaries.

Implementation of soil conservation practices

a) Construction of infiltration ditches.

In this activity the work consisted of opening of channels of rectangular or trapezoidal section of variable sections that depended on the topography of the ground and the texture of the ground. The construction was carried out transversely to the maximum slope of the terrain and following the level curves in the measurements of in the 40 cm * 40 cm in trapezoidal form, each section must be 10 m in length, with a wall of 1 m in length, this practice is carried out to reduce the velocity of the water from runoff activity, preferably at the beginning of the rainy season, and the rehabilitation of the same ones must be carried out at the beginning of the rainy season.

b) Rehabilitation of infiltration ditches.

As part of the recovery process, rehabilitation of the native prairies, the third year of project execution was the general desilting of the infiltration ditches of the 14 beneficiary communities of the project, leaving them with the characteristics of a new construction of ditches, with the purpose that the ditches fulfill their function of collecting the water of the rains and in this way recover the degraded prairies due to lack of humidity.

c) Reforestation of natural pastures by cuttings.

This activity consisted in the planting of cuttings of the species *Festucadolichophylla* "chillhuar" and *Dactylisglomerata* "dactylis", stolons of *Trifoliumrepens* "white clover", taking advantage of the beginning of the rainy season from December to January, it was a fundamental work and with a lot of responsibility for the sprout of the cuttings, a hole of a depth of 15 cm with a diameter of 15 to 20 cm was made, in which the cuttings were planted in a distance of 60 * 80 cm from plant to plant and from row to row respectively, in order to repopulate the conditions of natural pastures, in an average proportion of 75% of grasses and 25% of legumes, once installed organic matter was incorporated. The vegetation censuses were then carried out to obtain necessary information to calculate the condition of the parcels or sites, using the method described by Parkert "transect to the passage", due to its advantages over the parcel method with fixed dimensions, mainly because it is fast and allows you to capture georeferencing sampling points ". This method allowed us to record the perennial and annual vegetation, mulch, moss, bare soil, rock and erosion pavement, every two steps along an imaginary line of 200 steps, and a total of

100 readings were obtained, which were registered in a vegetation census form. For the census of vegetation, the census ring (20 mm diameter) was used, the census ring was placed every two steps on the tip of the left foot in order to eliminate bias.

d) Production of pastures grown in rainfed.

This activity consisted in the introduction of exotic species such as *Trifoliumrepens* "white clover", *Dactylis*

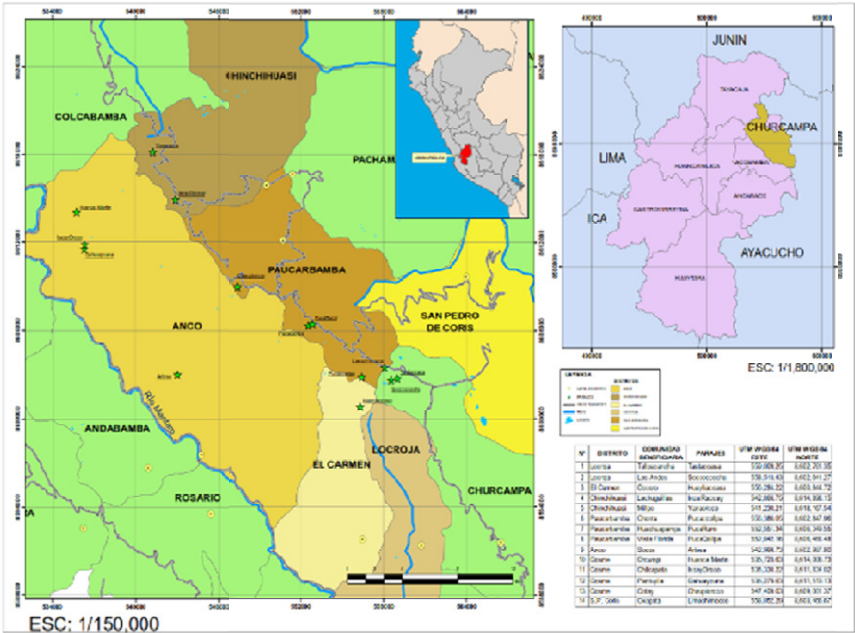


Figure 1. Location map of the study parcels

glomerata"dactylis", English rye grass, Italian ryegrass, fodder oats and vicia sativa, this crop is installed using the loose soil from the infiltration ditches so that it can supply enough moisture and nutrients to the seeds of the pastures, which will be incorporated with organic matter based on decomposed guano, this activity was carried out in 1.20 meters wide by 1000 meters, which was carried out in the months of September and October.

e) Closure of prairies with livestock mesh.

This activity consisted of making holes 40 cm deep with a diameter of 30 to 40 cm, every 2.5 m of length from hole to hole, this with the purpose of guaranteeing the resistance before any intruder such as an animal or other physical forces that can harm to the work, which were covered with livestock mesh.

Forestation in the headwaters of micro-watersheds

a) Forestry plantation insilvopasture.

This activity consisted in the first place in marking the holes, with extentionist's technical direction every 1.5 m to 2.0 m from hole to hole, to the lower edge of the infiltration ditches approximately at about 1.20 m, after which proceed with the construction of holes, for the opening of holes a technique is followed, the hole must divide into two parts horizontally, with a width of 40 cm; the depth is 40 cm, from which the soil of the first 20 cm should be removed to the right side and the next 20 cm should be removed to the left side; this activity allows permeability of the roots to the lower layers and provide nutrients for the normal development of the plants installed, which incorporates organic matter and their respective fertilization.

b) Application of decomposed guano and hydroabsorbent.

This activity consisted in the application of decomposed corral guano plus 20 grams of hydroabsorbent per plant.

c) Management of forest plantations insilvopasture.

This activity consisted in the crowning of forest plantations, of the species *Pinus radiata*"pine", *Polylepis*"quinual" and *Cytisus racemosus*"ceticio", stressing of dead plants by different factors, fertilization of forest plantations, irrigation of forest plantations providing 4 liters of water per plant per month and all these activities were carried out with the aim of having a homogeneous forest with a uniform growth.

Capacity building at the community level and training of promoters

a) Regional internship of promoters and community leaders.

This activity consists of a regional trip to visit the similar work to exchange experiences, and then replicate them in their communities on the subject of recovery of highlands prairies and management of prairies, in this case it was

scheduled to visit the community of AyasTarma - Junín region, because they have similar work to this project and otherwise by the planner's recommendation.

b) National internship of promoters and community leaders.

A trip to the Cusco region and the provinces of Quispicanchi, Canchis and Espinar was carried out at the national level, with the purpose of exchanging similar experiences, then replicating them in their communities on the subject of recovery of high Andean prairies and management of prairies.

c) Prairie and environment care campaign.

This activity consisted of making broadcasts on the prairie and environmental care campaign, through radio broadcasts or other means of communication, parades were held, due to the celebration of the forest week, world water day, world day of earth and other environmental events, for which government and non-governmental authorities were invited (educational institutions of the three levels, authorities and beneficiary members of the community and the population in general), which were carried out in the Chonta and Cosmesector.

D) Project Management.

This activity consisted of baselines in three stages, evaluation of forest plantations, cultivated pastures and recovery of prairies, which have been satisfactorily fulfilled.

RESULTS AND DISCUSSION

Capacity building

Capacity building on natural prairie management has been considered as an educational process, applied in an organized and systemic way so that the trained ones acquire and develop knowledge and skills in the management and improvement of high Andean natural prairies and can change attitudes towards present problems in the pasture, soil and water resources, for which the project beneficiaries were trained in problem analysis, recovery strategies and rational management and conservation of high Andean natural prairies.

Strengthening in prairie management

There were 02 events per year, making a total of 06 events of each of them, which were made with papers by experts in the field, in the sectors of Chonta and Cosme, the materials were prepared according to the cultural level of the beneficiary members of the community.

A total of 06 training courses were developed in pasture recovery, 06 in natural pasture management and 06 events in management of natural high Andean prairie, 06 events in natural resources management and 06 events in community organization and management during the

project execution period, having achieved 100% of what had been programmed within three years of project execution. The members of the community have revalued their knowledge and have been complemented with new experiences on the strategies of recovery and management of natural pastures demonstrated through the construction and maintenance of ditches of infiltration, collection and transplantation of cuttings of natural pastures, as well as the repopulation of *Festucadolichophylla*, and planting of grasslands such as *Trifoliumrepens*, *Dactylisglomerata* and *Rye grass* (English and Italian).

Implementation of soil conservation practices

As a consequence of poor management practices of the natural pasture, such as overgrazing, and the erosive tendency of pasture - soil resources (PRADERAS, 2010), degraded natural prairie recovery and soil conservation practices were implemented through the construction of infiltration ditches in the 14 communities of the prairies project, which in 100% of the areas designated for their construction show a soil analysis of acid pH, ranging from 4.0 in Chilcapata to 5.0 in the communities of Qahuaycuna (Cosme) and Pucacollpa (Paucarbamba) respectively, having a problem of acidity (De la Cruz, 2016). The infiltration ditches are channels of rectangular or trapezoidal section, which have been constructed transversally to the slope of the terrain in curves of level, whose dimensions and spacing can be seen in the methodology of its construction (AGRORURAL, 2014), the same ones that were in function of the rainwater precipitation and the physical characteristics of the soil. They have the purpose of controlling the runoff and collecting rainwater, which will reduce erosion, increase soil infiltration and moisture (Rodríguez, 2010), which has favored the recovery, regrowth and growth of natural pastures, cultivated and from forest plantations, as well as the increase of the flow of the springs of the lower parts of the micro watershed. The same ones that have been manually constructed in the 14 communities. With regard to the diagnosis of initial state of the pasture condition and endurance of the natural prairies of the 14 beneficiary communities at the beginning of the prairie project, it was concluded that most of the sites of grazing pasture were overgrazed and in a straight process of deterioration leading to erosion, which resulted in the existence of a low community animal load for the animal population; for which it was necessary to implement strategies of recovery and rehabilitation of these degraded prairies and deforestation and desilting for the rehabilitation of infiltration ditches, considering as an alternative the repopulation of natural pastures with palatable natural species desirable for the feeding herbivorous animals: such as for sheep, cattle, alpacas and llamas; through simple techniques such as the transplant of *Festucadolichophylla* by cuttings, with the

aim of increasing the desirable natural pastures, to increase the productivity of animals with more meat, more milk and more wool, more young and therefore higher economic income and therefore the improvement of settlers' quality of life of the rural community under the intervention of the project. For the evaluation of the adaptability conditions of planting of cuttings in 14 communities in the province of Churcampá, one is considered as a unit each of the parcels, of which representative samples were taken statistically, next the extension of the intervention sites were detailed according to the initial proposal of the project, according to technical file, it was proposed to plant an extension of 79 ha, being able to install a total of 1558.35 thousands of cuttings of the species of *Festucadolichophylla*, *Dactylisglomerata* and *Trifoliumrepens*, covering the entire project area, which includes the 14 project communities, covering a total area of 9218 ha, with an additional 20.18 ha to the initial proposal, which corresponds to a larger number and percentage to the species *Festucadolichophylla* with 650.85 thousands of cuttings, representing 41.77%, followed by second place in population of species *Dactylisglomerata* with 503.75 thousands of cuttings that represents the 32.33%, followed finally in smaller number *Trifoliumrepens* with 403.75 thousand cuttings representing only 25.91% of the total. The percentage of mortality of *Festucadolichophylla* was 32.79%, of *Dactylisglomerata* was 16.30%, so an underpinning of 320 thousand of *Dactylisglomerata* were done and 75 thousands of *Festucadolichophylla*. In the case of *Trifoliumrepens*, there was a mortality greater than 59.96%, not proceeding to its underpinning. Likewise, as a result of the opening of ditches of infiltration of curves of level, taking advantage of the harvest of water of the infiltration ditches and by movement and accumulation of earth in the edges of the ditches, an apparent microclimate was generated for the installation of pastures grown annually or for cutting in association as oats and vicia, and perennials as the association of grasses and legumes (Rye grass and clovers), in order to serve as a nutritional supplement for livestock, in addition to increasing the bearing ability of the grazing site and reducing animal load pressure or as temporary tutors against frost (freezing) for other species of cultivated pastures, as well as for forest plantations, using botanical seeds for sowing.

It is important to note that for rainfed conditions where irrigation water is not available, water harvesting from infiltration ditches is used, cultivated pastures should only be installed at the edge of ditches and not in all areas with minimum tillage, after selection of the most suitable plant species, since pasture under adverse conditions is likely to be lost over time, which is not the case with native pastures, better adapted to our soil conditions and high Andean climate of the high lands of Peru (Rodríguez, 2010).

Evaluation of the coverage (%) of the cultivated pastures

There is a great variability of the coverage of the cultivated pastures in association of grasses and legumes and also by fodder species planted and measured to the outbreak, varying from a percentage of coverage in relation to the vegetated area of the total reference area or a " Square meter sensor: *Dactylis glomerata* varies from 5% in Cotay to 67% in Pantuylla; English Rye grass: varies from 7.5% in Soccos and Chonta to 32.5% in Vista Florida; *Trifolium pratense* varies from 0% in Pantuylla and Oxapata to 10.7% in the Andes; *Trifolium repens* varies from 0% in Pantuylla, Cotay, Occoro, Chonta, Vista florida, Huachuapamapa, and Millpo to 11.5% in Oxapata, probably due to the fact that this fodder species only recently settled in the definitive field at two or three years after its installation (Dávila, 2015) and finally the presence of weeds vary from 7% in the communities of Cotay and Chonta to 23% in Occoro, which indicates their high degree of invasion recommending weeding at the time of cutting.

Determination of height of cultivated pastures

It was determined that plant height of fodder species cultivated in association between grasses and legumes, installed at the edge of infiltration ditches, and plant height (cm) was measured from the soil surface to the terminal part of the inflorescence, there was a variation of the height of the average plant from 15.18 cm in the cultivated pastures of the community of Soccos, which represents 25.53% of the total height of the Italian Rye grass as a reference (60 cm) to 36. 70 cm of the pastures of the community of Chonta, which represents 61.16% of the reference pasture; It should be noted that the evaluation was made at the second cut and at the beginning of the rainy season in the month of November.

Determination of green fodder yield (expressed in kg of green fodder and / or dry matter per ha).

There is a great variability with respect to the fodder yield of the cultivated pastures installed in the 14 communities of the project, with a general average of: 0.991 kg / m² and 991 kg / 1000 m² / cut and for two cuts 1982 kg / 1000 m² / year , It is worth mentioning that in 1 ha, 1,000 m² have been installed, because in the other remaining areas the other native and forest species are installed, which will allow to create a favorable microclimate for the soil - plant - animal interrelationship, with a sustainability of 0.12 Unity Bovine / 1000 m² / year or 0.98 Unity ovine / 1000 m² / year, increasing the support capacity of the natural pastures in recovery and allowing the rest of the same ones, without affecting its regrowth; however, the average weight of green fodder of 0.23 kg in the pastures of the Pantuylla rural community varies to 1.85 kg in the cultivated pastures of the peasant community of Los

Andes, whose fodder yield is low to medium in relation to the ideal which could be obtained in the same conditions of installation or that is in the edges of the channels or ditches of infiltration (Gobierno Regional de Junín, 2008). It has been considered for the calculations of bearability that a Bovine Unity, equivalent to a cow of 450 kg of body weight and Ovine Unity, is equivalent to a sheep of 55 kg of body weight and consuming 10% of green fodder of its body weight.

Closure of prairies with grazing mesh

The closure of prairies is a very important activity when it comes to recovery of degraded prairies. The most common practice for the recovery and management of grazing lands in native prairies, is referred to the restriction of the temporary entrance of the animals to certain areas, with the purpose of avoiding or reducing grazing for periods of time and not to deteriorate the fodder resource and achieve the recovery of the pasture condition and obviously the endurance to climax condition (Gobierno Regional de Junín, 2008). These restrictions on the protection of degraded grazing areas, are conducted in the so-called pitches, sites, pastures, reserves, pasture modules, etc. which consists of the construction of perimetric fences in a determined area of land (Flores et al, 2006), in this case of the project was used wire mesh meshes, complemented with barbed wire and wooden posts. In all cases, the temporary closure was carried out with 9-wire cattle netting, for a period of the last two-year evaluation.

This practice is fundamental for rational rotational management of natural grasslands, but it is vitally important for the purpose of temporary closure in cases of extreme overgrazing or places of poor condition (as in the case of grazing lands of the 14 communities included in the project) in order to achieve the regeneration or recovery of the natural grasslands and their subsequent appropriate or rational management, it allows to complete the life cycle through phenological states including flowering, fruiting and seeding for reproduction and recovery. (Rodríguez, 2010). The time of temporary closure of the pastures ceded by the communities, depended on the state of deterioration in which the sites of the native prairie were located.

Pasture condition and sustainability of the initial and final grazing sites - 2016

At each site or pasture recovery module, an inventory and site description were performed using the "Transect to step" method (Flores et al, 2006). To determine the pasture condition. The pasture condition for the different animal species has been determined by interpolating the indexes: decreasing, vigor, fodder index and DRP. The sum of the weighted value is compared with the scoring-condition scale; in which we can perceive that the condition of good pasture prevails in 13 evaluated sites and only one of regular condition in the

Table1. Classification of pasture condition and sustainability of natural pastures evaluated by animal species – Churcampa

Nº	COMMUNITY	SITE	ÁREA EVAL. ha	CONDITION PASTURE/SPECIES ANIMAL	Score	SOPORTB. ÓPTIMAL CALCULATED	ANIMAL LOAD CALCULATED U.A./ha/year
1	ORCCUMPI	HUANCA MARTÍN	3	GOOD. Bov.	65.63	2.25	0.75/ha/year
			3	GOOD. Ov.	56.13	9	3.0/ha/year
2	CHILCAPATA	ISCAY ORCCO	6	POOR. Bov.	34.2	0.78	0.13/ha/year
				FAIR. Ov.	44	9	1.5/ha/year
3	PANTUYLLA	QAHUAY CUNA	2	FAIR. Bov.	42.67	0.76	0.38/ha/year
				FAIR. Ov.	41.22	3	1.5/ha/year
4	SOCCOS	ARTESA	2	FAIR. Bov.	50.03	0.76	0.38/ha/year
				FAIR. Ov.	52.03	3	1.5/ha/year
5	LOS ANDES	SOCCOCCOCHA	5	GOOD. Bov.	54.53	3.75	0.75/ha/year
				GOOD. Ov.	62.53	15	3.0/ha/year
6	OXAPATA	LIMACHI MOCCO	2	FAIR. Bov.	49.12	0.76	0.38/ha/year
				GOOD. Ov.	60.62	6	3.0/ha/year
7	OCCORO	HUAYLLACCASA	15	FAIR. Bov.	52.02	5.7	0.38/ha/year
				GOOD. Ov.	64.67	45	3.0/ha/year
8	VISTA FLORIDA	PUKAQOLLPA	4	GOOD. Bov.	63.06	3	0.75/ha/year
				GOOD. Ov.	74.06	12	3.0/ ha/year
9	COTAY	CHAUPI ORCCO	15	FAIR. Bov.	48.81	5.7	0.38/ha/year
				GOOD. Ov.	65.81	45	3.0/ha/year
10	LECHUGUILLAS	INCARACCAY	2	FAIR. Bov.	47.64	0.76	0.38/ha/year
				GOOD. Ov.	62.74	6	3.0/ha/year
11	MILLPO	YANAORCCO	7	FAIR. Bov.	47.5	2.66	0.38/ha/year
				GOOD. Sh	54.1	21	3.0/ha/year
12	HUACHUAPAMPA	PUCARUMI	5	POOR. Bov.	24.8		0.13/ha/year
				FAIR. Ov.	43.84	7.5	3.0/ha/year
13	CHONTA	PUCACCOLLPA	3	VERY POOR. Bov.	17.1	0.21	0.07/ha/year
				FAIR. Ov.	42.9	4.5	3.0/ha/year
14	TULLPACANCHA	TASTACCASA	8	POOR Bov.	24.47		0.13/ha/year
				FAIR. Ov.	42.205	12	3.0/ha/year

SOURCE: Evaluation of the Prairie Condition - Transection to Step and Agrostatic Mapping in the 14 Communities of the project. Churcampa-Huancavelica, March – 2015

peasant community of Chilcapata-Cosme; which indicates that there was a clear recovery in relation to the evaluation of the pasture condition of the year 2015, thus improving the current animal load capacity. If we compare it with the initial and process evaluation of the years 2015, we see that the good pasture condition, followed by the regular condition and the existence of the very poor pasture condition, in the last evaluation no longer exists the pasture condition neither poor nor very poor, in summary the pasture condition was improved in all cases except in the site of the peasant community of Orccumpi - Huanca Martin.

One aspect that should be emphasized is the composition of vegetal plant species at the initial evaluation

we found undesirable or undesirable species with high degree of weed invasion, among them *Aschiepulvinata*, *Opuntiaflocosa*, *Astragalo*, garbancillo and woody species *Margyricarpusstrictus* and *Pinanatos* among others without fodder value for the herbivorous animal; now to the evaluation after almost two years of closure, these undesirable species have decreased drastically and, on the contrary, we observe the presence of decreasing or desirable species important for the animal feed by its palatability (Table 1), where the decreasing species represent of 21.50 with a score of 49.68, with a pasture condition for sheep of FAIR in the Community of Lechuguillas - Incaraccay at 38.75 with a score of 65.71 and a pasture condition of GOOD in Vista Florida–

Table 2. Classification of the condition of the prairies evaluated by animal species Churcampa – 2015

Nº	COMMUNITY	SITE	DECREASING SPECIES	FODDER INDEX	D-R-P	VIGOR	Score	PASTURELAND CONDITION
1	ORCCUMPI	HUANCA MARTIN	V:16.75 O:26.75	16.7 16.2	16,7 16,7	6,0 6,0	56,13 65,63	GOOD GOOD
2	CHILCAPATA	ISCAY ORCCO	15 5.5	14.5 14.2	14,5 14,5	0,0 0,0	44,00 34,20	FAIR POOR
3	PANTUYLLA	QAHUAY CUNA	12.75 5.5	16 14.7	16 16	6,5 6,5	51,22 42,67	FAIR FAIR
4	SOCCOS	ARTESA	14 12	15.6 15.6	15,6 15,6	6,8 6,8	52,03 50,03	FAIR FAIR
5	LOS ANDES	SOCCOCCOCHA	17.5 10.5	19 18	19 19	7,0 7,0	62,53 54,53	GOOD GOOD
6	OXAPATA	LIMACHI MOCCO	20 10.5	16.2 14.2	16,2 16,2	8,2 8,2	60,62 49,12	GOOD FAIR
7	OCCORO	HUAYLLACCASA	25 13.75	17.8 16.4	17,8 17,8	4,1 4,1	64,67 52,02	GOOD FAIR
8	VISTA FLORIDA	PUKAQOLLPA	29.5 19.5	18.4 17.4	18,4 18,4	7,8 7,8	74,06 63,06	GOOD GOOD
9	COTAY	CHAUPIORCCO	25.5 9.5	16.8 15.8	16,8 16,8	6,7 6,7	65,81 48,81	GOOD FAIR
10	LECHUGUILLAS	INCARACCAY	25 10.5	15.4 14.8	15,4 15,4	6,9 6,9	62,74 47,64	GOOD FAIR
11	MILPO	YANAORCCO	20.5 15.5	16.8 15.2	16,8 16,8	0,0 0,0	54,10 47,50	GOOD FAIR
12	HUACHUAPAMPA	PUCARUMI	6 18	3.3 13.2	16.5 6.8	-1 4.84	24.8 43.84	POOR FAIR
13	CHONTA	PUCACCOLLPA	3.5 18.5	8.2 14.7	0.9 5.2	4.5 4.5	17.1 42.9	VERY POOR FAIR
14	TULLPACANCHA	TASTACCASA	8.17 18.75	6.31 14.2	7.86 2.8	2.13 6.45	24.47 42.2	POOR FAIR

SOURCE: Evaluation of the Prairie Condition - Transection to Step and Agrostatic Mapping in the 14 Communities of the project. Churcampa-Huancavelica, March – 2015

Pucacollpa for sheep, with regard to the evaluation of the year 2015, where the declining species represented between 5.5, with a score of 34.20, with a pasture condition for sheep of POOR in the Communities of Chilcapata-Cosme-Iscayorcco to 25.75 of desirable or decreasing vegetal species with a score Of 65.63 with a condition of grassland GOOD in the community of Orccumpi - Huanca Martín Paraje (Tables 2 and 3).

Forest plantations by communities

The initial proposal of the project was to install forest plantations in the 79 ha; However, 88.08 ha have been installed, according to the evaluation of the forest

plantations that are in two planting systems: one of them in silvo pasture in the contour of the infiltration ditches and the other in a living enclosure. To this time a total of 72416 forest plants were used, including the underpinnings carried out in 2015, this activity was carried out throughout the project area which includes the 14 communities of the project, occupying a total area of 88.08 ha, of which the largest number and percentage belongs to the forest species *Pinusradiata* with 37278 plantations representing 51.46%, secondly the forest species *Polylepisspp* with 34141 seedlings representing 47.19%, thirdly and with a minor number *Cytisusracemosus* with 976 plantations representing only the 1.35% of the total. It should be noted that the main cause of mortality of the three forest plants

Table 3. Classification of the condition of the prairies evaluated by animal species Churcampa – 2016

Nº	COMMUNITY	SITE	DECREASING SPECIES	FODDER INDEX	D-R-P	VIGOR	Score	PASTURELAND CONDITION
1	ORCCUMPI	HUANCA MARTIN	25	15.3	4.7	8.85	53.85	GOOD
			21.97	11.56	15.75	0.11	49.39	FAIR
2	CHILCAPATA	ISCAY ORCCO	23.25	15.1	5.1	9.01	52.46	FAIR
			16.41	13.63	17.25	0.33	47.62	FAIR
3	PANTUYLLA	QAHUAY CUNA	23.75	16.3	3.9	9.57	53.52	GOOD
			23.81	12.39	14.05	0.81	51.06	FAIR
4	SOCCOS	ARTESA	28	15.1	4.9	9.74	57.74	GOOD
			21.46	12.17	13.75	2.13	49.51	FAIR
5	LOS ANDES	SOCCOCCOCHA	36.25	18.7	1.5	8.5	64.95	GOOD
			14.25	12.9	19.4	0.33	46.88	FAIR
6	OXAPATA	LIMACHI MOCCO	34.33	18.67	1.33	8.15	62.48	GOOD
			11.88	13.5	17	0.33	42.71	FAIR
7	OCCORO	HUAYLLAC ASA	35.75	19.17	0.93	8.16	64.01	GOOD
			18.06	11.49	19.86	0.45	49.86	FAIR
8	VISTA FLORIDA	PUKAQOLLP	38.75	18.4	1.7	6.86	65.71	GOOD
			20.38	13.7	19.4	1	54.48	GOOD
9	COTAY	CHAUPI URCCO	29	16.3	3.8	9.42	58.52	GOOD
			23.66	13	16.8	2.1	55.56	GOOD
10	LECHUGUILLAS	INCARACCAY	21.5	14.2	5.8	8.18	49.68	FAIR
			21.36	12.01	14.31	0.28	49.51	FAIR
11	MILPO	YANAORCCO	27.25	17.6	2.6	7	54.45	GOOD
			25.84	10.23	18.84	0.77	55.68	GOOD
12	HUACHUAPAMPA	PUCARUMI	31.5	16.1	3.9	7.12	58.62	GOOD
			29.53	13.63	20	0.9	64.06	GOOD
13	CHONTA	PUCACCOLLPA	29.75	14.8	5.2	8.59	58.34	GOOD
			27.71	13.8	20	1.2	62.8	GOOD
14	TULLPACANCHA	TASTACCASA	34.75	18.2	1.8	7.41	62.16	GOOD
			22.92	14.47	19.34	0.52	56.34	GOOD

SOURCE: Evaluation of the Prairie Condition - Transection to Step and Agrostatic Mapping in the 14 Communities of the project. Churcampa-Huancavelica, November - 2016

was the "frost". The cause of the mortality of the forest plants in relation to the percentage of sprout is explained by the distribution of both the maximum and minimum temperature is heterogeneous as is the case with rainfall, conditioning an adverse situation especially due to the lower rainfall occurred during the year 2016 (945.3 mm), in relation to the rainfall of 2015 (1126.5 mm), added to the prolonged dry season especially during the year 2016 (SENAMHI, 2016) and to register critical temperatures during the months of intense solar radiation during the day and very frigid nights accompanied by night frosts, which produces a sudden very drastic change of temperature between day and night, which added to the water stress of the year and the season, have influenced the mortality of

the forest plants even though they had initially sprouted in the previous year and reached a plant height of 1.85 m (Figures 2 and 3).

Plantations of *Pinusradiata* by communities

The population of forest plantations per plant species and per beneficiary community, only *Pinusradiata* in the community of Socos with 1647 plantations was planted exclusively as a single forest species, no plantations were found in the communities of Tullpacancha and Los Andes (Figure 4).

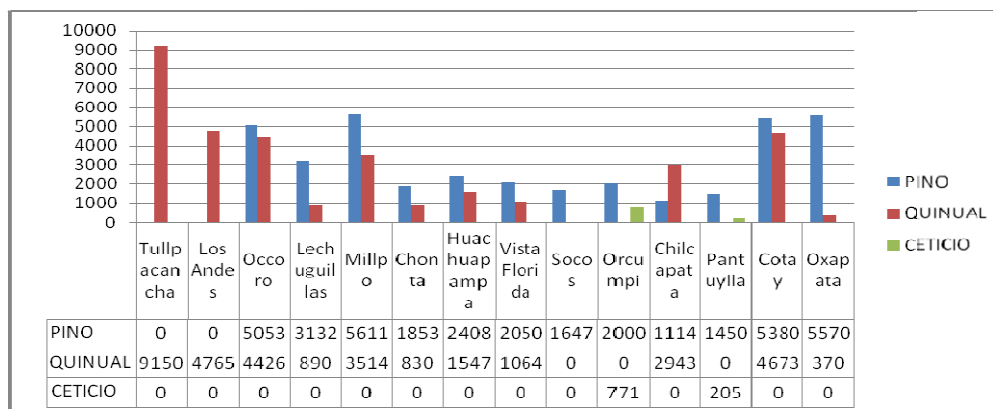


Figure 2. Total forest plantations installed by communities

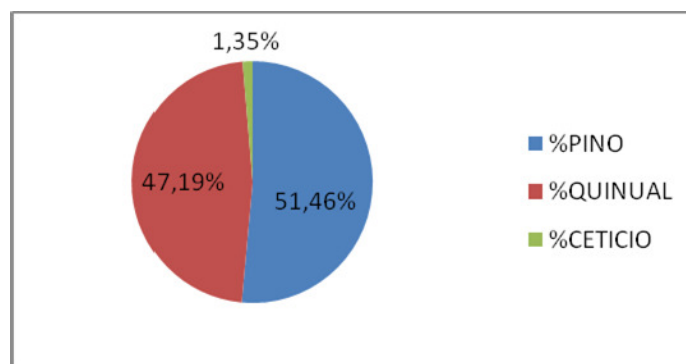


Figure 3. Total percentage of forest plantations installed by species

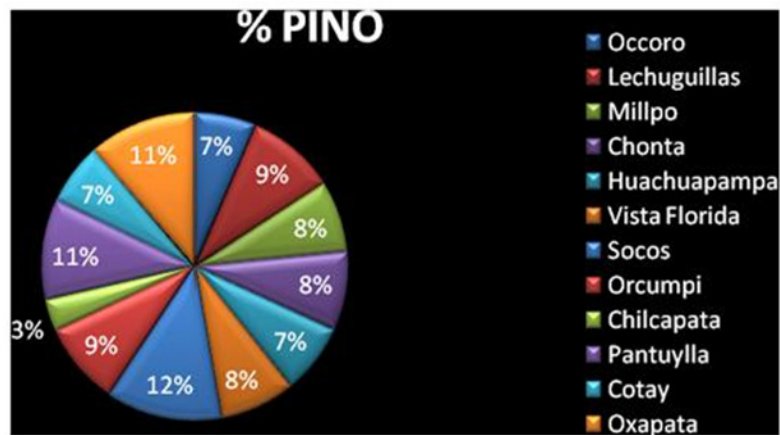


Figure 4. Percentage of pine plantations by communities

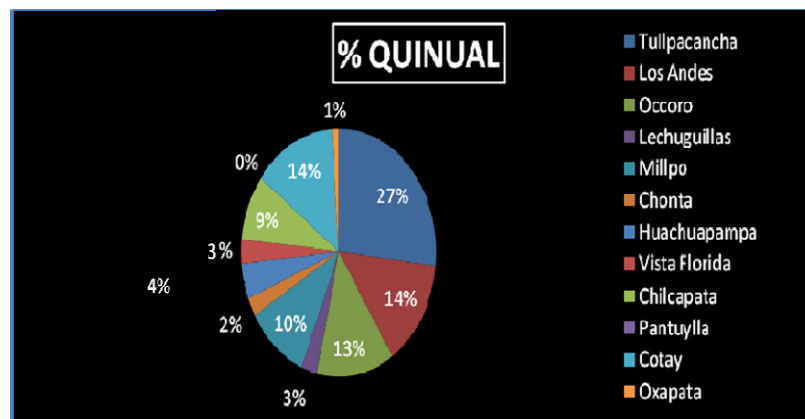


Figure 5. Percentage of quinal plantations by communities

Plantations of *Polylepis* by communities

The population of forest plantations by plant species and by beneficiary community, have been planted exclusively in the communities of Tullpacancha 9150 plantations and Los Andes 4765 plantations (Figure5).

Plantations of *Cytisus racemosus* by communities

Pucacollpa of Vista Florida and secondly the bad condition, with 117 plantations in Huallpaccasa of occro And only 12 plants in Artesa Soccos and very few pine plantations in good condition, with 74 plantations in Artesa Coccos and 03 plants CCahuaycuna - Orccoumpi that would be desirable to achieve; of a total of 37268 plantations (Figure 7).

Current state of the forest plantations of *Polylepis*

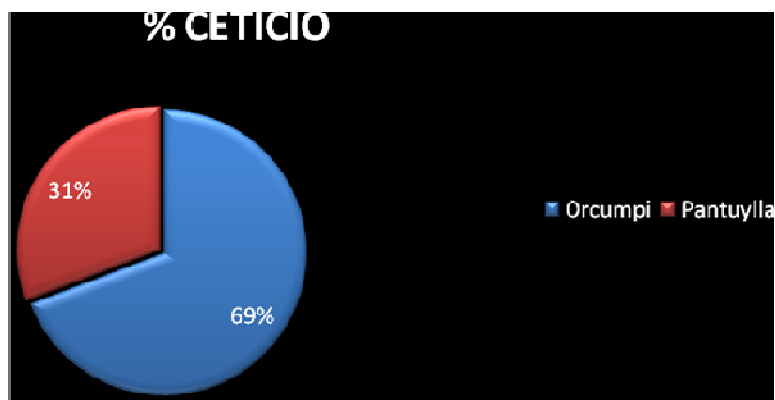


Figure 6. Percentage of ceticio plantations by communities

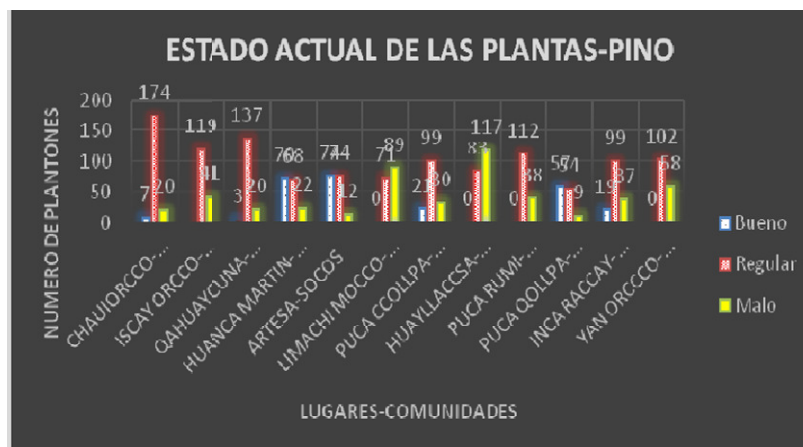


Figure 7. Current status of pine plantations by communities



Figure 8. Current status of quinquennial plantations by communities



Figure 9. Current status of community-based plantations

Current state of the forest plantations *racemosus* of *Cytisus*

process evaluation, which shows in all cases a large number of living plants (74%), compared to a 26% condition in the only two communities that planted them; Orcocmpi (64 plants) and Pantuylla (54 plants) and of secondly the bad condition (18 plants) and (06 plants) and good (20 and 08 plants respectively) with similar behavior for the current state of the plant, The Orcocmpi community is making it better with a total of 976 plantations (Figure 9).

Average height (cm) of forest plantations of *Pinusradiata* by communities

The average height of the species *Pinusradiata* has varied from 35.8 to 36.62 cm in the community of Pantuylla to 66.9 cm in the community of Millpo and in the second and higher last evaluation corresponded to 85.18 cm, corresponding to the community of Chonta, a total of twelve communities of that planted this forest species, except for the communities of Tullpacancha and Los Andes.

Average diameter (cm) of *Pinus radiata* forest plantations by communities

The average diameter of the regular condition is observed in a smaller number of species *Pinusradiata* has varied from 0.32 cm in the

planted this forest species. Smaller number than that in the

From the current state of the forest plantations of *Pinusradiata* by communities

that in this case showed a greater number of the good condition (57 plants) for the three categories of sanitary status; and finally the good condition was the dead plantations, which represents 23% of a total of ten communities that planted this forest species. In the last

mortality; ranging from the lowest observed mortality in the forest species *Cytisusracemosus* is in regular Vista Florida community, to a mortality of the plant

observed in the community of Occoro; And a high viability establishment of the plant in the community of Cotay with 181 plants of the 200 plants sampled, with respect to a smaller number of living plants of the community of Oxapata with only 65 plants, of the total of the twelve communities that planted this forest species.

Sanitary status of *Pinusradiata* forest plantations by communities

The sanitary status of the species *Pinusradiata* shows a number of plantations in followed by the bad condition the regular state (63%), (23%) and fewer good conditions (14%) than would be desirable to reach a total a total of ten communities that planted this forest species. In the last evaluation of the process, it shows in all cases firstly a regular condition (61%), followed by the bad condition (26%) and finally the good condition (13%), which would be the best condition to find; in the same way the

observed in the community of Vista Florida (54 plants), with regard to the same condition in the community of Cotay community of *Huachuapampa* at 0.84 cm In the community (174 plants) of 200 evaluated; and we observed a bad of Vista Florida and at 1.27 cm to the community of Chonta in the last evaluation, of a total of twelve communities that condition in greater number in the community of Occoro (117 plants), with respect to the same condition but in community of Vista Florida, observed in greater numbers in the community of Soccos (74 plants), The current state of the species *Pinusradiata* shows a greater number of living plantations representing 77% than versus the good condition but community of Cotay with (07 in smaller number of the plants) of the 200 plants

sampled, out of a

Causes of mortality of plantations of *Pinusradiata* by communities

The forest species *Pinusradiata* shows high mortality due to frost (92%), followed by the second cause of mortality due to lack of irrigation (8%), out of a total of ten communities that planted this forest species. According to the last evaluation of the process, it is observed in the majority of cases the cause of primary mortality is due to frost (94%) and only in four of the twelve communities due to irrigation causes (6%). The Occoro community presents a higher number of plant mortality due to frost with 117 dead plants and in less number of mortality of the plant in the community of Soccos, of the total of the twelve communities that planted the forest pine species. As a consequence, frost is the main cause of mortality of *Pinusradiata* (Florezet al, 1992), especially due to the lower rainfall occurred in 2016 (945.3 mm), compared to the rainfall of 2015 (1126.5 mm), added to the long dry season during the year 2016 (SENAMHI, 2016) and a record critical temperatures during the months of intense solar radiation during the day and of very frigid nights accompanied by night frosts, which produces a sudden change of temperature between day and night, which added to the water stress of the year and the season, have influenced the mortality of forest plants despite having initially sprouted in the previous year.

Average height (cm) of the forest plantations of *Polylepispp* by communities

The average height of the species *Polylepispp* has varied from 43 cm in the community of Huachuapampa to 68 cm in the Occoro community of a total of eleven communities that planted this forest species. According to the last evaluation, the average height of the forest species *Polylepispp* has varied from 44 cm. in the community of Huachuapampa to 69 cm in the community of Occoro of a total of eleven communities that planted this forest species.

Average diameter (cm) of the forest plantations of *Polylepispp* by communities

Of the average diameter of the species *Polylepispp* has varied from 0.3 cm in the community of Huachuapampa to 1 cm in the community of Occoro of a total of eleven communities that planted this forest species according to the last evaluation, the average height of the species *Polylepispp* has varied from 44 cm in the community of Huachuapampa to 69 cm in the Occoro community of a total of eleven communities that planted this forest species.

Current status of *Polylepispp* forest plantations by communities

The current state of the forest species *Polylepispp* shows a larger number of living plantations, which represents 71%, than the dead plantations, which represent 29% of a total of eleven communities that planted this forest species, are similar to the last evaluation of the process. Frost is considered the main cause of mortality of the quinoa, especially due to the lower rainfall occurring during 2016 (945.3 mm), compared to rainfall in 2015 (1126.5 mm), in addition to the prolonged dry season, especially during the year 2016 (SENAMHI, 2016) and to record critical temperatures during the months of intense solar radiation during the day and of very frigid nights accompanied by night frosts, which produces a drastic temperature change between day and night and added to the water stress of the year and the season, have influenced the mortality of forest plants despite having initially sprouted the previous year.

Sanitary status of *Polylepispp* plantations by communities

The sanitary status of the species *Polylepispp* shows a higher number of plantations in the regular state (70%), followed by the bad condition (30%) and in no community the good condition (0%) was found, it would be desirable to reach a total of eleven communities that planted this forest species.

Causes of mortality of *Polylepispp* plantations by communities

The causes of mortality of the forest species *Polylepispp* shows a high mortality due to frost causes (100%), being it the only cause of mortality of the plant; out of a total of eleven communities that planted this forest species, with frost being considered as the main cause of mortality of *Polylepis spp*. As a result, frost is the main cause of mortality of quinoa, especially due to the lower rainfall occurring during 2016 (945.3 mm), compared to rainfall in 2015 (1126.5 mm), during the prolonged dry season, especially during the Year of 2016 (SENAMHI, 2016) and to record critical temperatures during the months of intense solar radiation during the day and of very frigid nights accompanied by night frosts, which produces a very drastic change of temperature between day and night (Dávila, 2015), which added to the water stress of the year and the season, have influenced the mortality of forest plants despite having initially sprouted in the previous year.

Average height (cm) of the plantations of *Cytisusracemosus* by communities

The average height of the species *Cytisusracemosus* ranged from 106.88 cm in the community of Pantuylla to 113.25 cm in the Orccumpi community of a total of two communities that planted this forest species. In the last evaluation, it has not varied keeping it from 107.98 cm in the community of Pantuylla to 114.28 cm in the Orccumpi community of a total of the only two communities that planted this forest species.

Average diameter (cm) of forest plantations *Cytisusracemosus* by communities

Of the average diameter of the shrub species *Cytisusracemosus* has varied from 0.46 cm in the community of Orccumpi to 0.47 cm in the community of Pantuylla of a total of the only two communities that planted this forest species. According to the last evaluation, it has been maintained, of 0.49 cm in the community of Orccumpi to 0.50 cm in the community of Pantuylla of a total of the only two communities that planted this forest species.

Current status of *Cytisusracemosus* forest plantations by communities

The current state of the shrub species *Cytisusracemosus* shows a greater number of living plantations representing 87% than the dead plantations, which represents 13% of a total of the only two communities that planted this forest species.

Sanitary status of the forest plantations of *Cytisusracemosus* by communities

The sanitary status of the forest species *Cytisusracemosus* shows a greater number of plantations in the regular state (70%), followed by the good condition (16%) and in less number the bad condition (14%) of a total of two communities that planted this forest species.

Causes of mortality of forest plantations of *Cytisusracemosus* by communities

The causes of mortality of the forest species *Cytisusracemosus* show a high mortality due to frost (100%), being it the only cause of mortality of the plant; of a total of two communities that planted this forest species. As a consequence, the frost is the main cause of mortality of this species, especially by the smaller rainfall occurred during the year 2016 (945.3 mm), in relation to the rainfall of 2015 (1126.5 mm), in addition to the prolonged dry season especially in 2016 (SENAMHI, 2016) and to record critical temperatures during the months of intense solar

radiation during The day and of very frigid nights accompanied by night frosts, which produces a sudden change of temperature between day and night, which added to the water stress of the year and the season, have influenced the mortality of plants. This activity was accomplished with the crowning activity of the forest plantations, of the species of *Pinusradiata* and *Polylepis* spp, both in silvopasture, and in living enclosure, as for the underpinning of the dead plants by different factors using the same techniques of forest plantations, in this case only in the holes that the plants have died, for it was used a total of 19134 plants of quinoa and 1897 plants of *Pinusradiata*.

Capacity building at the community level and training of promoters

a) Regional internship of promoters and community leaders
This activity consisted of a trip at the regional level to visit similar work to exchange experiences, then replicate them in their communities on the subject of recovery of high land pastures and management of prairies for the accomplishment of this activity a trip to the Junin Region was done, visiting the facilities of the Experimental Station of INIA-Santa Ana-Huancayo, the IVITA Experimental Station. El Mantaro of the National University of San Marcos, as well as visiting the city of Tarma –The Zonal Tarma Agro Rural Agency, and in the company of professional specialists from this institution, it was possible to visit the facilities of the Ayas Community Enterprise and the peasantry community of Huasahuasi, places where similar work was observed on the conservation of prairies and forest plantations. The successful experiences of the organizations visited have made it possible to raise awareness of the project beneficiaries of the prairie project about the importance and benefits of conservation and management of natural pastures, to contribute to the strengthen in go flocaland regional knowledge with successful experiences in the recovery and rational management of the prairies.

b) National internship of promoters and community leaders

For the fulfillment of the national internship, all administrative technical personnel accompanied by the beneficiary members of the community of the project traveled to the Cusco region with the purpose of exchanging experiences and then replicating in their communities on the subject of recovery of high Andean prairies and management of prairies, the visits they made were to the provinces of Quispicanchi, Canchis and Espinar, with the purpose of observing similar work. In order to consolidate the regional internship, it has been necessary to reinforce the capacity of the project beneficiary partners with extra regional and national visits to consolidate the initial awareness of personal

development and self-esteem, consolidate the management system of similar organizations, consolidate capacities both individual and collective for a rational management of the prairies through successful experiences in planting and harvesting of water as a strategy to minimize the climate change that affects the people of the high Andean areas of the Peruvian high lands (Dávila 2015).

c) Prairie and environment care campaign

As for the care of prairies and the environment was carried out, 02 events per each of them per year, which were developed in the following way, through parades and talks, in subjects such as water day, of the earth were sensitized with parades with banners allusive to the event developed, for this events there was a participation of students of three levels of basic education, at the same time there was the participation of the beneficiary community members, while in the forest week there were talks on the importance of the forest plantations and a parade in the Cosme sector, with the participation of the students of the three levels of basic education, with banners allusive to the forest week.

d) Project management

This activity consisted of making baselines in three stages and evaluation of forest plantations, cultivated pastures and prairie recovery, as measurement parameters to the work done at the level of the beneficiary communities.

According to the first baseline (2015), 87% of the surveys indicate that they do not know about grassland burning compared to only 13% that if they are aware of this, in the mid-project evaluation 29% were unaware of this activity; and in the third and last baseline (2016) 91%, of the people knew the importance of burning pastures and only 9% did not know the advantages and disadvantages of burning natural pastures; 100% indicate that forest plantations have been carried out in their community, corroborated with the results of the third and last baseline (2016), which state that there are forest plantations in areas designated for the project, 100% do not know about the closure In the mid-project evaluation and do not care about it, 32% were unaware of this activity and 75% participated in the closure of pitches or prairies and 25% of the respondents do not know, according to the third and last baseline (2016); with respect to the start of the project and the first baseline (2015), 100% were not aware about field rotation, 29% were not aware about this activity in the middle of the project, the last and third baseline (2016) 79% mention to know about it, with regard to the benefits and advantages offered by the rotation of the pitches; while 21% do not practice or are unaware of this activity; regarding the silvopasture system in the first evaluation (2015), 100% did not know about reforestation or did not give importance to it, in the mid-project evaluation, 18% did not know about this activity and 86% knew about the benefits and

advantages that provide the management of silvopastures and 14% of respondents mentioned not to know about this activity and up to 2016, 91% recognized the importance of natural pastures as a natural resource and 9% mentioned not to know about it. On cultivated pastures, at the first evaluation (2015), 56% did not know about natural pastures or did not care about it and in mid-project evaluation, 18% were unaware of this activity and by 2016 86% know about the benefits and advantages provided by cultivated grass for the feeding of herbivorous animals and 14%, mention not to know about it. Finally, to the question about knowing about prairie management in the first evaluation (2015), 93% did not know about prairie management, compared to only 7% who had knowledge and in the second evaluation only 10% did not know about this activity.

CONCLUSIONS

- 06 training sessions were fulfilled regarding the recovery of pastures, 06 in management of natural prairies, high lands, 06 events in natural resources management and 06 events in community organization and management during the project execution period, achieving 100% compliance with capacity building.
- Infiltration ditches have been built in the 14 communities included in the prairie project area; 100% of the areas destined for its construction show an analysis of acid pH soil, varying from 4.00 in Chilcapata to 5.0 of pH in the communities of Qahuaycuna (Cosme) and Pucacollpa (Paucarbamaba) respectively, being a problem of acidity; where according to the record it is proposed to execute 79 ha of infiltration ditches, achieving at the end an extension of 88.08 ha, which equals 88080 linear meters of infiltration ditches, contributing to the planting and harvesting of water in the head of the basin.
- 100% of the infiltration ditches were desilted, in order to fulfill the function of retention and conservation of rainwater formoisture.
- A total of 1558.35 thousands of cuttings of the *Festucadolichophylla*, *Dactylisglomerata* and *Trifoliumrepens* species were installed in the 14 communities of the project, occupying a total area of 92.18 ha of the 79 ha proposed; from which the *Festucadolichophylla* species has a greater number and percentage with 650849 thousands of cuttings, representing 41.77%, followed by second in population of species *Dactylisglomerata* with 503,751 millars of cuttings representing 32.33%, followed finally in less number *Trifoliumrepens* with 403.751 thousands of cuttings representing only 25.91% of the total. With this practice, the number of species desirable for animal feeding has been increased and the animal carrying capacity has been improved, as well as improving soil fertility, by incorporating white clover, planting natural and

palatable naturalized grass cuttings for animal feeding and recovery of natural prairies and water retention through the vegetable mattress. The percentage of mortality of *Festucadolichophylla* was 32.79%, of *Dactylisglomerata* was of 16.30%, so underpinning of 320 thousand of *Dactylisglomerata* and 75 thousands of *Festucadolichophylla*, in the case of *Trifoliumrepens*, it had a greater mortality of 59.96%, so no underpinning proceeded.

- The percentage of coverage of cultivated pastures varies from 5% in Cotay to 67% in Pantuylla, English Rye grass varies from 7.5% in Soccos and Chonta to 32.5% in Vista Florida, *Trifoliumpratense* varies from 0% in Pantuylla and Oxapata to 10.7% in the Andes *Trifoliumrepens* varies from 0% in Pantuylla, Cotay, Occoro, Chonta, Vista florida, Huachuapamapa, and Millpo to 11.5% in Oxapata, probably due to the fact that this fodder species was only stable in the definitive field after two to three years of its installation and weeds vary from 7% in Cotay and Chonta to 23% in Occoro, which indicates its high degree of invasion recommending weeding at the time of cutting. The green forage yield in kg of the cultivated pastures whose average overall was of 0.991 kg / m² and 991kg / 1000 m² / cut and by two cuts 1982 kg / 1000 m² / year; and the sustainability was 0.12 Unity bovine / 1000 m² / year or 0.98 Unity ovine / 1000 m² / year, which would increase the support capacity of natural pastures in recovery. As for the average green fodder weight varies from 0.23 kg in the Pantuylla pastures to 1.85 kg in Los Andes.

- Grasslands portrait a good condition in 12 evaluated sites and there are only two in regular condition in the peasant community of Chilcapata - Cosme; which indicates that there was a clear recovery in relation to the evaluation of the pasture condition of the year 2015, thus improving the current animal load capacity, which compared to the initial and process evaluation of the year 2015, the condition of good grassland condition, followed by a fair condition and the existence of a very poor pasture condition, that in the last evaluation there is no longer a poor or very poor pasture condition, and it was possible to improve the pasture condition in all cases except in the site of the peasant community of Orccumpi - Huanca Martin, as a consequence of the rest through the closure of the sites.

- 37278 forest plantations of *Pinusradiata* (51.46%), 34142 of *Polylepis* spp (47.19%) and 976 of *Cytesusracemosa* (1.35%) have been installed, identifying "frost" as the main cause of mortality of the three plantations, as well as the lower precipitation registered in 2016 with 945.3 mm, compared to 2015 that registered 1126.5 mm, added to the prolonged drought period of 2016, which caused water stress, which lead to perform crowning, underpinning and supplementary fertilization.

- By 2016, on capacity building, 92% of the beneficiaries surveyed mentioned having received talks about natural resource management and only 8%

mentioned not to know about the subject. 91% mentioned that they had talks about cooperative, associativity and communal enterprise and only 9% mentioned not to know about the subject; 91% mentioned that received talks about the environment and 9% mentioned not to know about the subject, with an increase in capacity building during the two-year duration of the project.

- Regional and national internships were addressed to technical staff, promoters and community leaders who were beneficiaries of the project, with the aim of exchanging successful experiences with institutions that have been carrying out similar work on the conservation of prairies and forest plantations. At the regional level, the Mantaro Valley, the San José de Ayas Community Enterprise and the Peasant Community of Huasahuasi of the Province of Tarma - Junín region and at the national level, the provinces of Quispicanchis, Canchis and Espinar of the Cusco region were visited to consolidate human capacity both individually and collectively, on planting and harvesting of water, as a strategy to minimize climate change in the communities included in the prairie project.

BIBLIOGRAPHIC REFERENCES

- AGRORURAL (2014). Manejo de Pastos Naturales y Asociados. Boletín Técnico. Tratamiento de Cuencas Altas. Agencia Zonal Churcampa-Huancayo.
- Dávila, C. (2015). Siembra y Cosecha de Agua de Lluvias en los Andes. Experiencia: Fundo "La Cosecha del Futuro". INIA, santa Ana, Huancayo. Huancayo, Perú.
- De la Cruz, R. (2016). Línea de Base la Final del Proyecto. Proyecto: Mejoramiento, Rehabilitación y Manejo Productivo de Praderas Alto andinas en la Provincia de Churcampa - Huancavelica. Gobierno Regional de Huancavelica, GerenciaSubregional de Churcampa.
- Flores, A. y Bryan, F. (1989). Manual de pastos y Forrajes. INIES – Universidad de California, Davis. Lima, Perú.
- Flores, E.; Cruz, J.C.; y Naupari, J. (2006). Utilización de Praderas Cultivadas en seco y Praderas Naturales para la producción lechera. Boletín técnico. UNA La Molina, INCAGRO. Lima, Perú.
- Flórez, A.; Malpartida, E.; San Martín, F. (1992). Manual de Forrajes para Zonas Áridas y Semi-Áridas Andinas. Red de rumiantes menores (RERUMEN). INIAA, Universidad de California, Davis. Lima, Perú.
- Gobierno Regional de Junín (2008). Manual de Manejo y Evaluación de pastizales en las Zonas Alto andinas. Proyecto: mejoramiento y manejo de Praderas naturales Alto andinas en las Cuencas del los Ríos Cunas y Canipaco. Período 2008 – 2011. Huancayo, Perú.
- Gobierno Regional de Junín (2010). Experiencias y Resultados de mejoramiento y Recuperación de Praderas naturales en el Cunas y el Canipaco. Sistematización de la Información del Proyecto Praderas 2008 – 2010, Huancayo, Perú.
- ONERN (1984). Inventario y evaluación de los recursos naturales de la zona altoandina del Perú: reconocimiento: Departamento de Huancavelica.
- PRADERAS (2010). Recuperación de Praderas Alto Andinas con Chillhuar o Chuo (*Festucadolichophylla*). Proyecto: Mejoramiento y Manejo de Praderas Alto Andinas en las Cuencas de los Ríos Cunas y Canipaco. Período "008 – 2011. Región Junín.
- Rodríguez, R. (2010). Recuperación y Manejo de Pastos Nativos- Adaptación Local al Cambio Climático. AGRORURAL, Ministerio de Agricultura. Primera Edición.
- SENAMHI (2016). Registro de Precipitación Pluvial y de Temperatura Máxima y Mínima del Estación Co-Paucarbamba, distrito de Paucarbamba, provincia de Churcampa y Departamento de Huancavelica. Boletín Informativo.