

LIVELIHOODS AND COPING STRATEGIES BASED ON MIGRATION FOR FAMILIES AFFECTED BY ENVIRONMENTAL DETERIORATIONS IN HIGH ANDEAN COMMUNITIES¹

«THERE'S NO LIFE HERE; THAT'S WHY THEY WENT AWAY.»

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Abstract: In Andean communities, many families whose livelihoods depend on farming and raising livestock are exposed to increasing degradation of their ecosystem and to food insecurity. The objective of this paper is to examine the extent to which families use migration strategies, based on multi residence and migratory circulation, to diversity their sources of income and mitigate the consequences of ecological degradation on their living conditions. The results are part of a socio-demographic research conducted in 2015 and 2016, which focused on domestic strategies for addressing environmental problems in a sample of 203 families living in five high Andean communities around Lake Titicaca. Most of families have migrant members and young adults between ages 20 and 35 represent the largest number of them. Nevertheless, their departure

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does not constitute an explicit form of adaptation to the ecological degradation. The quest for better conditions and opportunities in urban territories as well as interests related to their life stage and cycle, are the main determinants of their migration decisions. Despite the ecological problems affecting families, the desire for personal autonomy of the migrants is the main impetus for migration and there is no family organization based on multi residence and circular migration as an explicit livelihood for adaptation to environmental deterioration in rural areas.

Key Words: Vulnerability, livelihoods, family, migration, Lake Titicaca, Peru.

Medios de vida y estrategias de adaptación basados en la migración por familias afectadas por los deterioros ambientales en comunidades alto andinas

«Ya no hay vida aquí; por eso se fueron.»

Resumen: En las comunidades andinas, muchas familias cuyos medios de vida dependen de la agricultura y la ganadería están expuestas a una degradación creciente de su ecosistema y a la inseguridad alimentaria. El objetivo de este artículo es examinar en qué medida las familias utilizan estrategias de migración, basadas en la multi residencia y la migración circular, para diversificar sus fuentes de ingresos y mitigar las consecuencias de la degradación ecológica en sus condiciones de vida. Los resultados son parte de una investigación sociodemográfica realizada en 2015 y 2016, que se centró en las estrategias domésticas para enfrentar los problemas ambientales, en una muestra de 203 familias que viven en cinco comunidades altoandinas alrededor del lago Titicaca. La mayoría de las familias tienen miembros migrantes y los adultos jóvenes entre 20 y 35 años representan el mayor número de ellos. Sin embargo, su salida no constituye una forma explícita de adaptación a las degradaciones ecológicas. La búsqueda de mejores condiciones y oportunidades en los territorios urbanos, así como los intereses relacionados con su etapa y ciclo de vida, son los principales determinantes de sus decisiones migratorias. A pesar de los problemas ecológicos que afectan a las familias, el deseo de autonomía personal de los migrantes es el principal factor para la

migración y no existe una organización familiar basada en la multi residencia y la migración circular como un medio de vida explícito que apunta a la adaptación frente al deterioro ambiental en las zonas rurales.

Palabras clave: Vulnerabilidad, medios de vida, familia, migración, lago Titicaca, Perú.

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1. Introduction

Peru is one of the South American countries that is most vulnerable to climate variabilities and degradations (Amat y León 2008; GIEC 2014). It is exposed to environmental deterioration that is manifested in different ways in the coastal, highland and Amazonian regions.² In high Andean zones, the steady decrease in precipitation and the reduction in runoff in glacial watersheds affect water supplies in water tables, wells and lakes that provide the population with water for livestock, agriculture, human consumption, energy production and ecosystem integrity (Magrin *et al.* 2007). The lack of water and the disappearance of pasture for animals in areas above 3,500 meters partly explain why some families are giving up raising livestock. Changes in temperature and water systems have also led to irregularity in the cycling between the rainy season (November to March), and the dry season (April to October) in the Andes Mountains. This climate variability due to increased episodes of drought directly affects subsistence agriculture, production systems and the organization of work in small farming families, contributing to food insecurity.

Although migration and environmental problems have been studied jointly in Peru (Altamirano 2014; Keikkinen 2017; Koubi *et al.* 2016) and internationally (Hugo 2008; Kaenzig & Piguet 2011; Kniveton *et al.* 2008), the correlation between the two variables merits greater attention in the Andean context. Countries such as Peru, Bolivia and Ecuador have an age-old migratory tradition in which spatial mobility, at different scales and/or in different ecological niches, represents a longstanding strategy that is integrated into the families' life cycles (Murra 2002). Forms of internal, regional or local mobility are key phenomena in these countries, particularly from rural areas toward cities, or in a circular pattern, with various stages, returns and multiple residences (Matos Mar 1990). The increase in the rural population and the degradation of available resources also leads to the

² Desertification of farmland in the Altiplano and on the Pacific Coast, more frequent and intense alternating cycles of drought and flooding in Amazonia, retreat of glaciers in the Andes Mountains since the 1970s.

implementation of multi-local family systems between rural Andean areas and urban zones (Cortes *et al.* 2014).

In this sense, family livelihoods based on human mobility and circular migration patterns from rural communities to urban localities can be observed in order to face increasing rainfall variability originated by climate and environmental change in mountain areas, which contributes to an addition of incomes from both agricultural production (allowing not to abandon family land) and more profitable urban jobs, eventually with daily round trips (Milan 2004). In the last decades, this kind of «seasonal» migration could (and can always) be understood as the quest for a lifestyle connected with a strategy for subsistence and diversification of activities carried out by male members of the family throughout the year to supplement the cultivation of various agricultural products (Aramburú 1986: 113). In fact, «when the availability of land and productive resources is diminished, the small farming family will increasingly depend on income it can obtain from the sale of its labor in local or national markets» (1986: 17). Migratory decisions also appear to be less frequent in cases of gradual and long-term climatic events (drought episodes in particular) than more sudden ones (such as flooding) that tend to induce population movements (Koubi *et al.* 2016).

However, not all populations are mobile when they experience environmental change and its negative impacts on their health and livelihoods. Using individual survey data from a migrant-sending area in highland Peru, Adams shows that low mobility potential, lack of resources and attachment to the place of residence interact and produce a situation of non-migration (Adams 2016). Family coping strategies are based on migration but also on alternative livelihoods such as canal construction and an irrigation system to optimize rainwater harvesting. Families with more social and educational capital, more economic resources, and more links to local policies are better able to develop adaptive capacities to environmental change (Keikkinen 2017: 85). It thus turns out that the increase in vulnerabilities among peasant families on the Andean highlands is not only linked to the climatic factor but also to the combined lack of social, economic and political capital of Andean rural populations (2017).

Beyond notions of «climate refugees» or «environmental refugees» and «climate migrants» (Hugo 2008; Myers 2002; Kaenzig & Piguet 2011), the objective of this paper is to examine the extent to which families living in high Andean communities use certain migratory strategies, sometimes more complex than permanent migration, and have access to other social and economic resources to diversify their incomes and make themselves less dependent on agriculture (Ellis 1997; Trivelli, Escobal, Revesz 2009), so as to mitigate the consequences of ecological degradation on their living conditions.

If the effects of climate change, particularly the rise of temperatures, generally produce population displacements, the hypothesis of this research is that in a context of environmental degradation, families tend to adopt adaptation strategies based on multi residence and migratory circulation between the locality of origin in the highlands and an urban area of destination, instead of a permanent migration. This hypothesis is based on the postulate that the environmental factor is part of a set of causalities in which social, economic, cultural and demographic dimensions interact in the implementation of family strategies. Multi residence and circular migration choices would constitute a mechanism of resilience (Cannon & Müller-Mahn 2010) developed by local populations to reduce their environmental vulnerability.

On this point, it is important to specify that the notion of *environmental vulnerability* proposed in the paper is inspired by the works of Robert Castel, who analyzes vulnerability as the continuum of situations located in an intermediate zone between integration (understood as a condition of socio-economic well-being) and disaffiliation (the final state of which is exclusion), and characterized as «a space of instability and turbulence, populated by individuals who have a precarious relationship with work» (Castel 1991). The notion of «environmental vulnerability» expands this definition of vulnerability to the eco-systemic sphere and considers the natural phenomena (related or not to climate change and global warming). That cause situations of threats, fragility, uncertainty and degradation in the living conditions of the populations that are exposed to and/or affected by natural processes and/or events produced by the environment that occur in their place of residence (and they are susceptible and possibly unable to cope with these climate variabilities and extremes).

2. Methods and data

This research is based on an analysis of the activities of each family member and, especially, the distribution of work and studies among the different generations (adolescents, young adults, adults and the elderly), distinguishing between the migrant and non-migrant population. The originality of this work lies in exploring the relationship between environmental vulnerabilities and population dynamics based on migration. This is located at the intersection of environmental, demographic and migratory issues, with a unit of observation and analysis at the level of families, their structure and organization, and with special attention to the roles of the different generations in the face of ecological changes, particularly the participation of young adults. The demographic weight of the group between ages 15 and 30

makes it indispensable for understanding the structuring of local economies and the mutations under way in rural areas of the Andean zone with regard to growing environmental problems.

The results presented in the paper are part of an exploratory socio-demographic research conducted in 2015 and 2016, which focused on domestic strategies for addressing environmental problems in a sample of 203 families living in five high Andean communities around Lake Titicaca, in the department of Puno (San José de Yungo, Chili Chambilla, Sico Pomaoca, Chila Pucará and Huacochullo Jatucachi) in Peru. After presenting the objective of the survey and obtaining permission from the community representatives, the sampling was carried out randomly between families, so that each one had the same probability of participating (approximately one in three families were selected). In these territories, the alteration of water resources changes the agricultural calendar and affects the well-being of families that are already exposed to multiple forms of vulnerability: weakness and irregularity of incomes, limited possibilities of social mobility for studies and/or work, lack of access to and weak presence of government services, etc. This situation is particularly reflected in the total poverty rate, which reaches 52,2% among households in rural Andean areas of Peru (INEI 2014). In addition, 26 in-depth interviews distributed among the five communities were conducted with families in which at least one person was living outside of the community and was considered a *migrant* member. In fact, the purpose of these interviews was to supplement information of the questionnaire concerning the reasons for migration of family members not present in the communities and to deepen the possible link between environmental degradations and the choice and strategies of mobility and occupation of migrants. The data collected through in-depth interviews allowed an articulation of the analysis between the quantitative approach (characterization of families and environmental problems, weight of migration in domestic strategies) and the qualitative approach (multiple choices linked to mobility between the community, origin and place of migration, migrants' aspirations and forms of assistance towards the family of origin).

As part of this study, a team of multilingual survey takers from the non-profit organization *Derechos Humanos y Medio Ambiente* applied a questionnaire about the families' living conditions, their level of well-being, household composition between migrant and non-migrant members, and environmental problems and their consequences. The questionnaires were applied in Spanish with 10,9% of those surveyed, Aymara with 81,1%, and Quechua with 8%. The communities of Chili Chambilla and Huacochullo Jatucachi are the most important demographically, with a total of approximately 150 families, while San José de Llungo, Sico Pomaoca

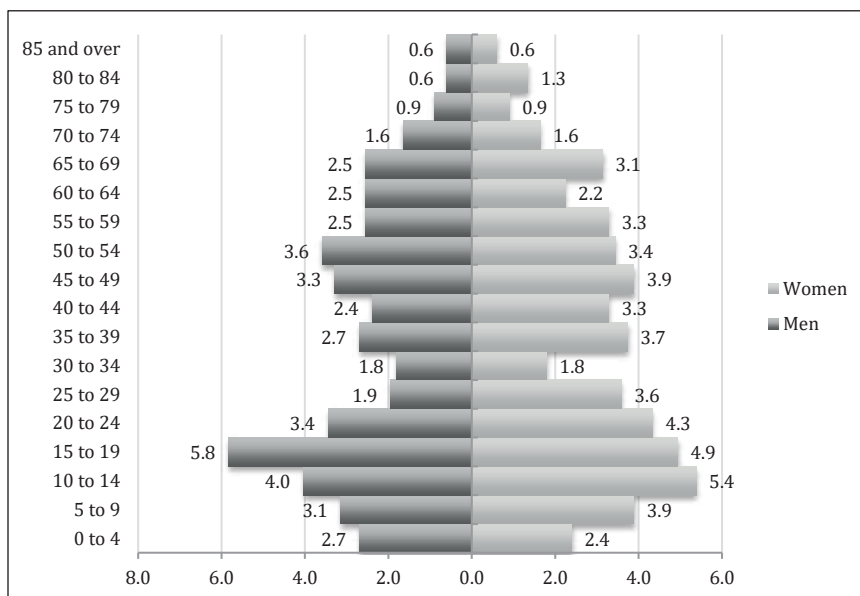
and Chila Pucará have a population of approximately 120 families.³ In the five localities, the questionnaires were completed with 31, 33, 35, 53 and 51 families, respectively.⁴

3. Results

3.1 Characteristics of the non-migrant population

The families surveyed in the five high Andean communities near Lake Titicaca have an average of 3,33 co-resident members. They therefore are not considered large families. The proportion of native members, those born in the community, is 75,9% of the individuals recorded.

Figure 1:
Population pyramid for the five communities surveyed (in %, n = 676)



Source: Field survey 2015-2016 (INTE-PUCP, DHUMA).

³ This information was kindly provided by the Civil Association *Derechos humanos y medio ambiente*. However, it was not possible to corroborate these data and to specify the total population of these communities with the last census carried out by the INEI in 2017.

⁴ The greater willingness of the families of Sico Pomaoca and Chila Pucará to participate in the survey explains the relative over-representation of these two communities in the sampling. However, these are families which have the same characteristics as those of other communities in terms of cultural origin, domestic organization and economic occupation.

The population pyramid of the five communities together (figure 1) takes the shape of a top; the narrow base reflects a relatively weak birth rate in the localities studied, particularly because of the migration of people of intermediate ages, which is reflected in the indentation in the middle of the figure. The pyramid could also be described as being shaped like an ace of spades.

The non-migrant population includes people who are single (42,7%), mainly children and adolescents; married (33,5%) and cohabiting (16,1%), generally with their parents; and widows and widowers (6,4%). Regarding religion, a large majority of persons identify themselves as Catholics (74,4%). Moreover, about two-thirds of adults over age 20 did not finish secondary school, and one-fourth did not complete primary school and have weak reading and writing skills.

Of the families surveyed, 95,1% engage in an activity related to raising livestock (cows, llamas, alpacas, sheep), and 82,6% also derive a livelihood from farming (potatoes, carrots, fava beans, etc.). The two results converge toward a majority profile of the families, describing a poly-activity based on a combination of farming and livestock. Raising barnyard fowl and small animals (chickens, ducks, guinea pigs) (36,9% of the families) appears as a supplementary activity. Of the families surveyed, 87,7% engage in at least two activities (livestock and farming), and 44,8% combine three (livestock, farming and raising barnyard fowl and small animals). Handcrafts and commerce are activities that involve only 15,8% and 2% of the surveyed families, respectively.

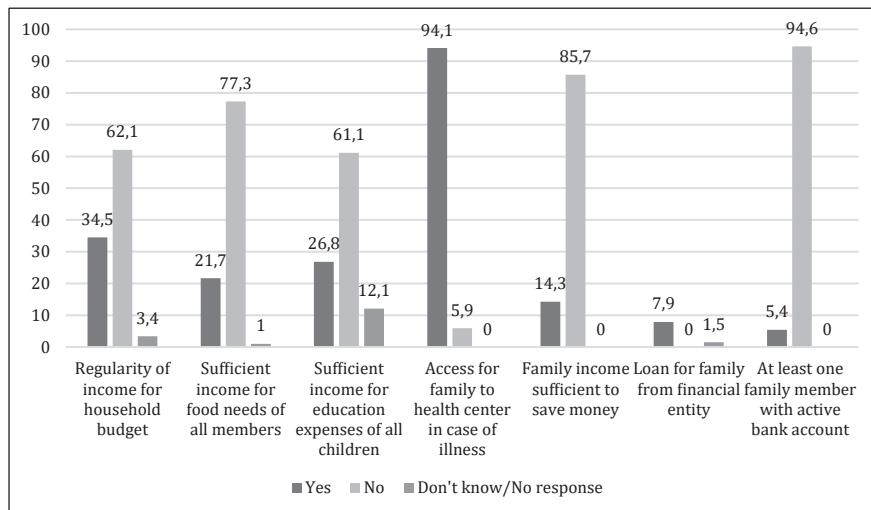
Furthermore, some 76,6% of the families have between one and 10 parcels of land, placing them in the category of small farmers. Only 5,5% have more than 30 parcels in the communities studied. Of the families whose most important activity is farming (n = 90), the average amount of land is 6,4 hectares, while the families that mainly raise livestock (n =100) have an average of 23,1 hectares.

Some 98,8% of the families dedicated to farming – regardless of whether this is their largest source of income – raise at least two crops, 90,5% at least three, and 57,1% at least four. This common strategy for diversification of agricultural production helps minimize possible losses of a specific crop (after an episode of drought or a hailstorm, for example) and ensure that there is enough food for family consumption and domestic food security.

Regarding the level of well-being of the families surveyed (figure 2), the majority (64,4%) receive no income other than that generated by farming and/or raising livestock. Among the 68 families that benefit from income besides their earnings from farming and livestock (35,6%), most of

the income comes from other economic activities not related to the rural farming world, such as construction (19,1%), mining (17,6%) or commerce (10,3%), while other income comes from social programs such as Juntos (8,8%) or Pensión 65 (16,2%).

Figure 2:
Indicators of the level of well-being of the surveyed families (in %, n = 203)



Source: Field survey 2015-2016 (INTE-PUCP, DHUMA).

Data show that the families have an irregular income (62,1%) that is insufficient to meet the food needs of all their children (77,3%) and cover school-related expenses (61,1%).

Martina H. Q., age 50, community of Chila Chambilla (27/10/2015):

Is the food you grow in your field for your own consumption or for sale?

No, it is for family consumption, and if I don't have enough, sometimes I have to find some other type of work. This isn't my only work. That's why I raise animals.

With your Wanimals and what you grow in your field, do you earn enough to educate your children?

No, it's not nearly enough. Sometimes even my children work. Every day we consume and we don't have enough. If we had enough, we would have good food, good clothing. We're not in that situation. Sometimes we're sick, because medicines are expensive.

Families have scant access to the financial system, as reflected in the percentages of those who have enough income that they can save money (14,3%), who have a loan with a financial entity (7,9%) or who have an active bank account (5,4%). These data reflect a profile of families that are not inserted into the capitalist market system, with exchanges mainly through the subsistence economy and bartering among families and communities.

3.2 Environmental problems affecting families surveyed

The most common environmental problems in the high Andean communities studied are related to frost snaps and drought, as well as plant pests and diseases, hail, and pollution of water and/or land, all of which affect agricultural production. The following table can be read horizontally and vertically. It shows the relative importance of each of the problems mentioned by members of the families in living conditions, as well as the frequency of the problems mentioned.

Table 2:
Environmental problems that affect or have affected the surveyed families, in order of importance (in %, n = 203)

Environmental problems	Order of importance								Total
	1	2	3	4	5	6	7	8	
Drought / water scarcity	32,0	33,5	25,6	7,4	1,0	0,5	0	0	100,0
Frost	61,6	34,0	3,4	1,0	0	0	0	0	100,0
Plant pests and diseases	3,4	12,3	23,2	7,4	0,5	0	0	0	46,8
Hailstorms	2,0	11,3	5,9	2,5	1,0	0	1,0	0	23,6
Pollution of water or land	0	1,5	4,4	5,4	3,0	0,5	0	0	14,8
Storms	0	3,0	5,4	2,5	1,0	0,5	0	0	12,3
Flooding	0,5	1,5	2,5	2,0	0	0,5	0,5	0	7,4
Thunder and lightning	0,5	0	3,0	1,5	0	0,5	0	0,5	5,9
Snowstorms	0	0	2,5	0,5	0	0	0	0	3,0
Deforestation	0	0	0	0,5	0	0,5	0,5	0	1,5
Total	100,0	97	75,9	30,5	6,4	3	2,0	0,5	/

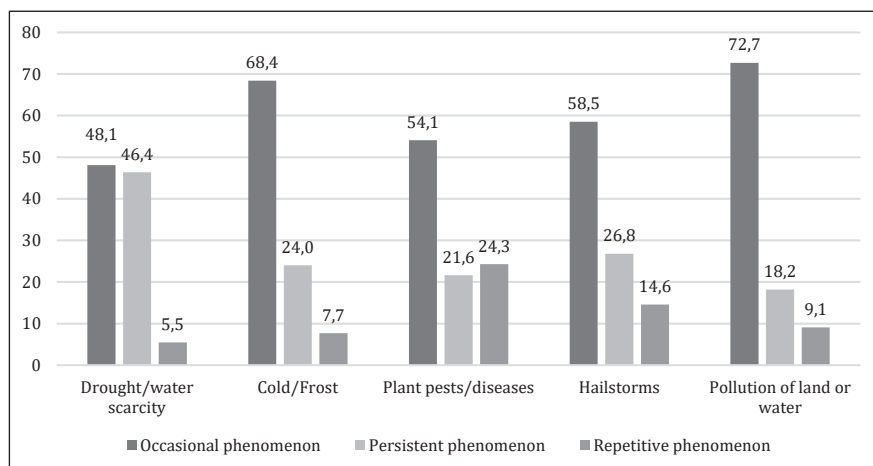
Source: Field survey 2015-2016 (INTE-PUCP, DHUMA).

Of all the environmental problems observed, frost and drought affect all of the families in the communities surveyed. Some 61,6% of them say frost is the most important problem, followed by drought in 32% of the cases.

Plant pests and diseases that lead to the loss of crops (potatoes, etc.) are also important. Families also mention hailstorms, pollution and storms as environmental problems that affect their lifestyles (destruction of electrical appliances, etc.). Reading the results vertically shows that all of the families have at least one environmental problem, and a large majority (75,9%) has as many as three.

Meanwhile, a look at the five most common environmental problems – drought, frost, plant pests and diseases, hailstorms, and pollution of land or water – makes it possible to examine how families characterize a phenomenon as «occasional,» «persistent» or «repetitive.»

Figure 3:
Frequency of environmental problems, according to surveyed families
(in %, n = 203)



Source: Field survey 2015-2016 (INTE-PUCP, DHUMA).

The ecological problems mentioned by the families are characterized by being «occasional» phenomena, meaning they are irregular and unexpected. In a breakdown of the results (figure 3), drought appears as the most persistent phenomenon during the periods when it occurs (46,4%), much more than hail (26,8%) or frost (24%). This result is decisive, because although families mention frost as the main environmental problem, drought and water scarcity are more persistent and have a greater impact on the daily life. Because of these environmental problems, the families speak of a series of consequences in their rural communities of origin, as shown in the following figure.

Fortunato C. A., age 52, lieutenant governor of the community of Chila Pucará (15/08/2016):

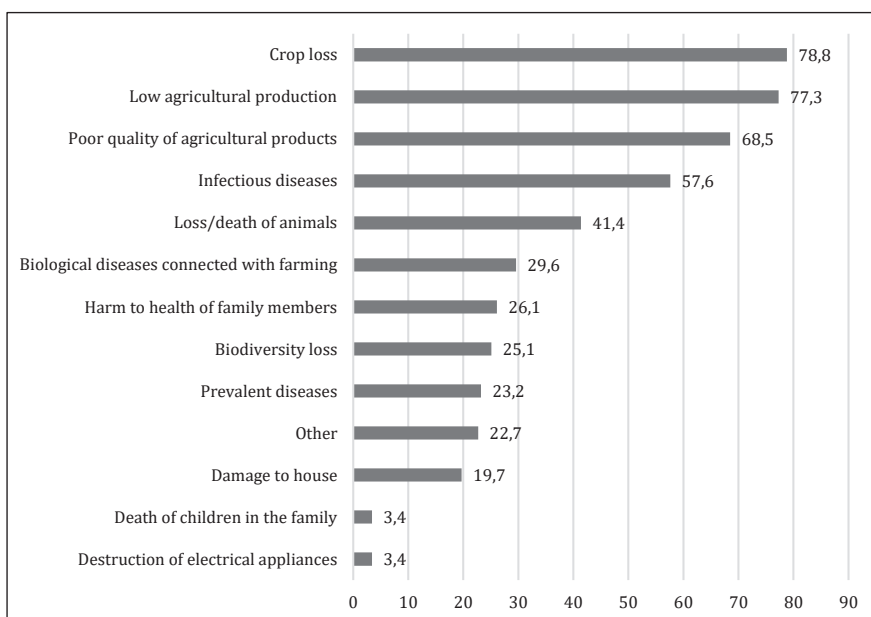
When there's a frost, what do you do?

When there's a frost, we go to the hill called Pucará and the entire community repents. We plead with God the Father. Sometimes it calms things. We build fires to heat the earth.

How is the water?

We have several springs and rivers, but there's less. In a few years, they will dry up ...

Figure 4:
Impacts of environmental problems on living conditions of the families surveyed (in %, n = 203)



Source: Field survey 2015-2016 (INTE-PUCP, DHUMA).

The consequences of environmental problems are mainly related to agricultural production (figure 4), with a decrease in crops (78,8%) and in the production (77,3%) or quality of products (68,5%). A large majority of households describes a situation of vulnerability because of environmental impacts, which is experienced in their level of well-being. The main problems mentioned indicate a decrease in the production of agricultural products

for household consumption and for sale in regional markets, resulting in less income from this activity, which is the most important in the families' budgets. Finally, 98% of families recognize that the environmental problems affecting them are shared by the other families in the community. These are therefore problems that affect everyone, and which have a negative impact on all of the communities, and not just a few isolated families.⁵

Celedonio A., age 43, community of Chila Pucará (15/08/2016):

What has affected you this year?

More than anything, it's that there hasn't been rain. Frost has really affected us.

What gets damaged by the frost?

When there's a frost, it ruins everything: there are no potatoes, no barley, not even fodder for the animals. It has affected everyone.

What do the animals do when there's a frost?

They all get skinny...

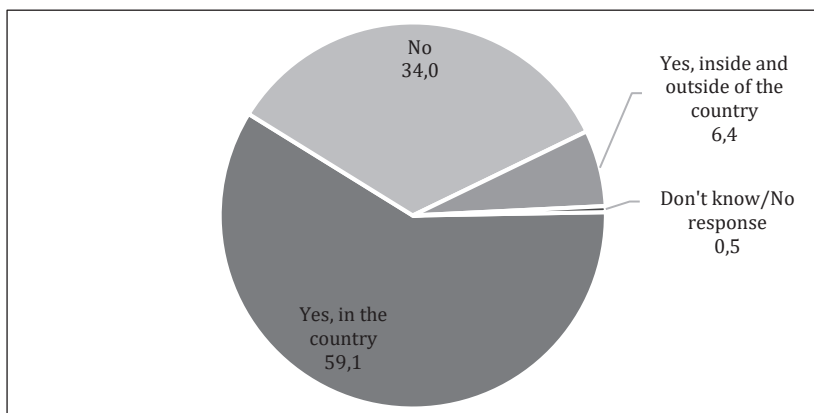
Finally, 95,6% of the families say they have received no preventive information from any authority about the environmental problems that affect them, and 91,6% have received no assistance from any institution related to the environmental problems they face. This marginal intervention by the State and other public and private institutions reinforces the families' vulnerability, as the lack of support affects their capacity for resistance and response to the environmental problems observed.

3.3. Characteristics of the migrant population

About two-thirds of the families surveyed said they had at least one member currently living outside of the community of origin. Despite their departure, these persons are considered members of the family, constituting an integral part of their organization. These are not individuals who have left their place of origin to form a family of their own separate from their family of origin, even though in some cases they have been gone for a number of years.

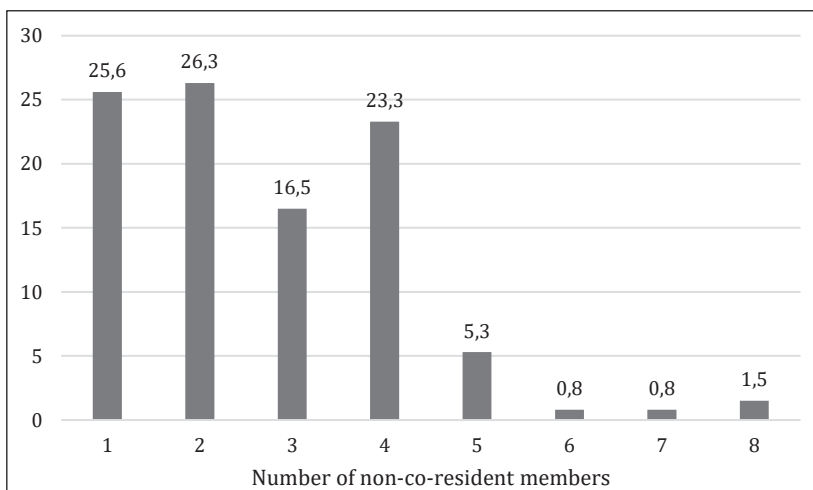
⁵ An exception to this are families whose homes are located close to springs, and who are therefore able to maintain enough access to water to irrigate their crops and decrease their exposure to a sharp drop in production during periods of drought.

Figure 5:
Distribution of surveyed families, by whether they have a member living outside of the community (in %, n = 203)



Source: Field survey 2015-2016 (INTE-PUCP, DHUMA).

Figure 6:
Number of non-co-resident members in surveyed families with a member living outside of the community (in %, n = 133)



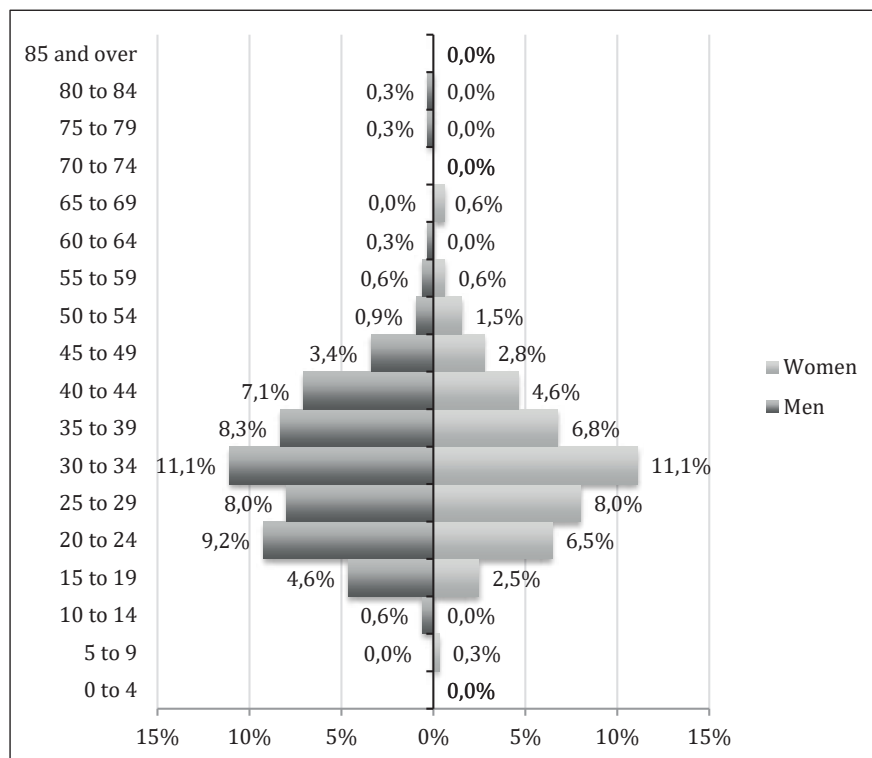
Source: Field survey 2015-2016 (INTE-PUCP, DHUMA).

Relatively similar proportions of families in these communities have one, two, three or four members at a time living outside of the community of origin; the most frequent case is of families with two members outside of the community (26,3%). The migration destinations are very diverse, although

in more than 90% of the cases, they are urban areas; approximately two out of every three migrants are in either Arequipa, Peru's second-largest city, which is located about six hours from the communities studied; Tacna, on the Pacific Coast on the border with Chile; or Juliaca or Puno, the largest cities in the department. Many intermediate cities and provincial towns are also home to a significant number of migrants (Andahuaylas, Moquegua, Desaguadero, Ilo, Juli, Laraqueri, La Rinconada, etc.). There is therefore a relative dispersion of destinations of migrant members of families, but also an evident concentration in urban areas.

The following population pyramid of migrant members of families shows the age and sex composition of the members of this group, 94% of whom are natives of the rural communities surveyed.

Figure 7:
Population pyramid of migrant members of surveyed families
(in %, n = 325)



Source: Field survey 2015-2016 (INTE-PUCP, DHUMA).

This pyramid shows that 53,9% of the migrant members are in the age groups from 20 – 34 years, which is the period of job training and/or labor activity. There are very few migrant members in demographically dependent age groups (under age 15 and over age 65). In fact, there are few children who migrate for education-related reasons and even fewer elderly people living outside of their locality of origin for reasons related to care or to be closer to health services.

Antonio M. Q., age 60, community of Chila Pucará (15/08/2016):

Why did your children leave?

There's no life here. That's why they went away.

Have the children of other families gone away, too?

Yes, they also left. Those of us who have stayed here are old; the children have all gone.

A slight majority of migrant members are men (55,7%), and a large percentage of them (90,1%) have a family relationship as children of the «head» of household in the locality of origin, which indicates that these migrations involve the youngest members of the families.

Migrant members of the families surveyed have lived in their current location for between five and nine years, and only 17,3% of them have changed their residence since leaving their community of origin. These data places them in persistent forms of migration and «settled» in their destination locality, although that does not eliminate the possibility of further mobility or of temporal come back to the locality of origin. In fact, in many of the families interviewed, migratory processes are seen as a back-and-forth dynamic between the community of origin and the destinations, characterized by a certain economic offering represented by some activity that is attractive to young adults. These forms of migration enable them to maintain strong ties to the community instead of installing themselves definitively in a specific urban area.

Porfirio A. C., age 57, community of Chila Chambilla (27/10/2015):

How many of your children have left?

They left here to study. They left for higher education.

Did all six of your children leave?

Only two have stayed.

Why did they go?

They all left to study. They are in Lima and Puno.

Are they working now or did are they still studying?

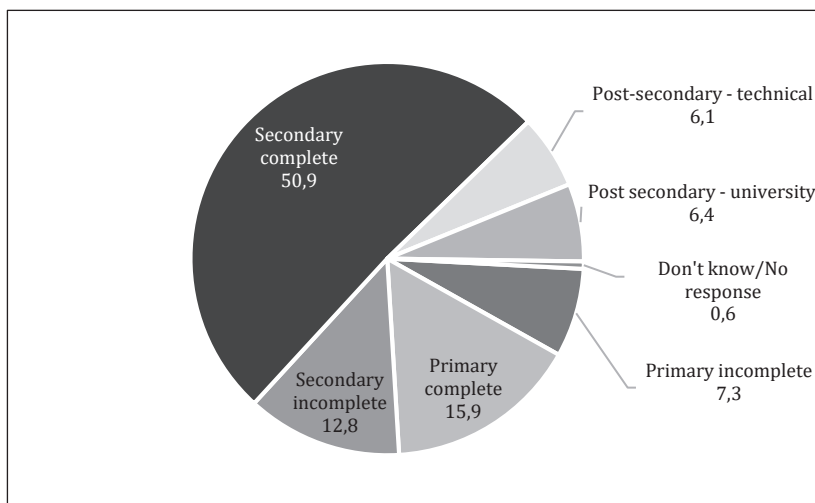
They are still studying. Only one is working.

What does the community think of children leaving? What's their opinion?

For studies, it's good. Sometimes it's worth having an education. That's why I always support my children in their studies. It's always good, it's worthwhile. It's not that way in the countryside, farm life. When you haven't studied, you're not worth anything.

The migrant members of the families surveyed in the five high Andean communities have an average level of schooling equivalent to completion of secondary school, without post-secondary education at either a technical school or a university (50,9% of the sample).

Figure 8:
Schooling level and studies of migrant members of the families surveyed (in %, n = 358)



Source: Field survey 2015-2016 (INTE-PUCP, DHUMA).

If half of the migrants finish secondary school, more than one-third of this population of young migrants has not completed secondary school, which places them in a precarious situation with regard to integration into the formal labor market, with a stable contract and social rights (access to the health-care system, etc.).

A high proportion of the young migrants (80,7%) are part of the Economically Active Population (EAP). The jobs they held are essentially precarious, poorly-paid and concentrated in the sectors of construction and bricklaying, commerce or street vending, collecting fares on buses, auto mechanics, transportation, electricity, restaurants and cooking, or in remunerated domestic activities, particularly for women. Some also work as teachers in public schools, and others have set up their own businesses in the textile or shoemaking sectors.

Petronila Q. A., age 49, community of San José de Lluno (19/10/2015):

Can you tell me which members of your family have left?

My two sons and my husband.

And where has each of them gone, and what are they doing there?

My two sons have gone to Arequipa; they work making wooden doors. And my husband is working in Juliaca. He works as a driver.

And how long have they been working there?

My husband has always worked there since he lived in Juliaca before, and my two sons left after they finished high school.

For more or less how many years have your sons been working in Arequipa?

Javier left five years ago to work, and Julio left three years ago.

And did both of your sons finish high school?

Yes, they both finished high school. (...)

Why did they leave the community?

Because they had already finished high school, they were already able to be on their own. They were helping me tend my animals. Later they wanted to continue studying. That's why they left to work and study.

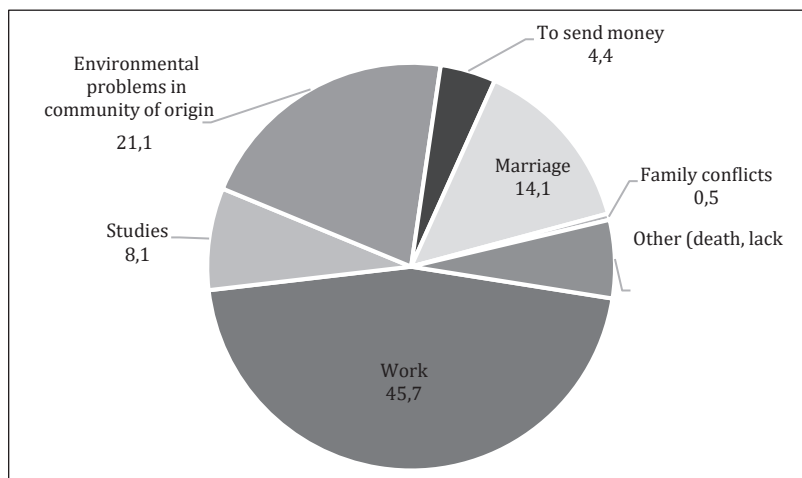
And your husband? Why did he go away to work?

He always worked in Juliaca, driving cars. Sometimes we didn't have enough money. That's why he went.

3.4. Migration and environmental problems

The following figure shows the motives for and objectives of migration for the sample of migrants from the families included in this study.

Figure 9:
Reasons for leaving the community of origin mentioned by the families surveyed (n = 133, in %)



Source: Field survey 2015-2016 (INTE-PUCP, DHUMA).

In nearly half the cases (45,7%), the young adult's decision to migrate was spurred by objectives related to work and employment outside of the high Andean community of origin. These are mainly cases of job-related migration from the countryside to cities.

The environmental factor only occupies second place among reasons for migration (21,1%). That does not mean that environmental problems are unrelated to the occupational goals on which young people from the communities base their migration decisions. This factor, however, does not appear as the most evident and spontaneous in the families' responses when they explain their children's' choices about mobility toward cities in the department of Puno or neighboring regions. Finally, migration for studies is rarely mentioned in the survey results (8,1%) and ranks lower than the choice to migrate because of marriage (14,1%).

Pedro C. R., age 72, community of Chili Chambilla (27/10/2015):

About your children, where are they living now?

My children aren't here any longer. Only my wife and I live here. Two of my children are in Tacna, one is in Arequipa, Ayaviri, Ilave, others are in Juli. They have gone because there is no more work, there aren't animals. The farm isn't profitable. The frost is killing everything. There's no work, so they need to leave the community.

What are your children doing in the cities?

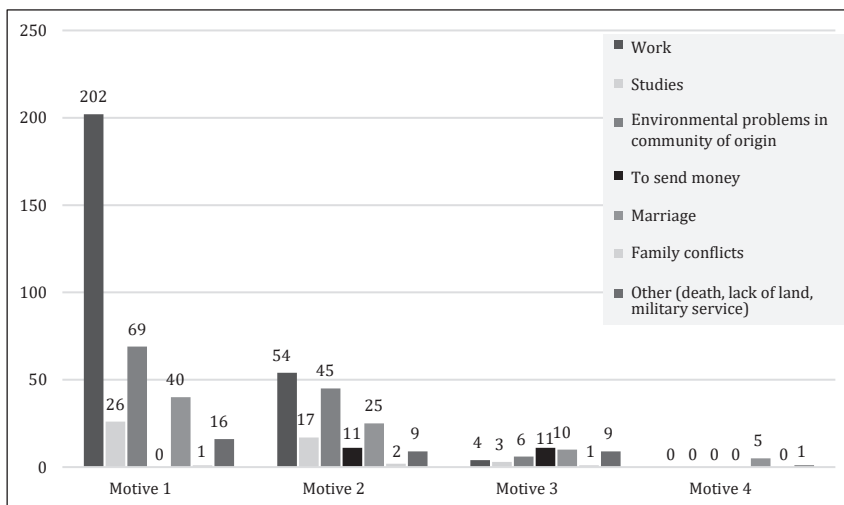
In the city they work as drivers; others in the bank. Alberto is in Tacna. Hermógenes is also in Tacna, as a driver. Edwin is Ayaviri; he's working in an office of the agrarian bank. My son Néstor is studying at the University of the Altiplano.

And how do they support you?

They help me on the farm, they help me treat my animals. They've installed my solar panel. They've bought me a television and they bring some food so we can live.

If we consider the reasons for leaving, in order of importance, from the standpoint of the family members who remain in the communities of origin, work is predominant in explaining why young people migrate, with an absolute value of 202 responses out of the 358 recorded. The environmental factor is mentioned in second place, ahead of marriage and studies, but clearly trailing work as a motive.

Figure 10:
Reasons why migrant members leave, in order of importance (1 to 4), mentioned by non-migrant family members (absolute value, n = 358)

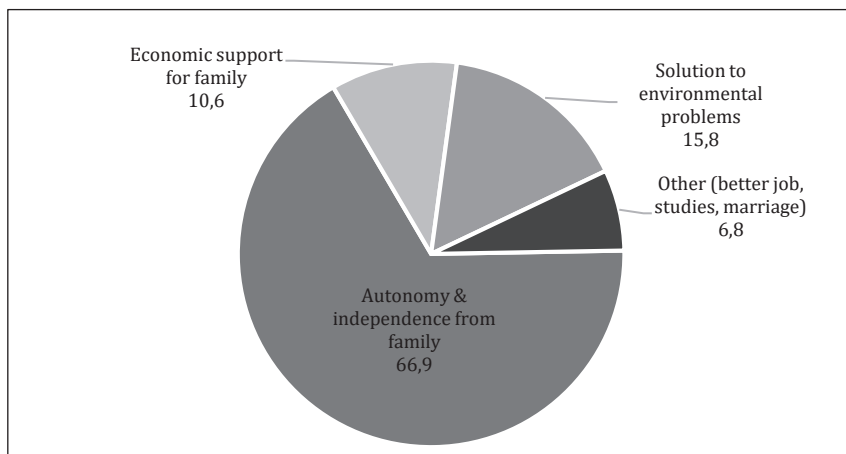


Source: Field survey 2015-2016 (INTE-PUCP, DHUMA).

Non-migrant members mainly mention a single motive («motive 1») to explain their family members' decision to migrate. Finally, regarding the objective in leaving the high Andean community, Figure 11 shows continuity with earlier results, given that in more than two-thirds of the cases (66,9%),

young people decided to leave their place of origin to seek autonomy and independence from their families.

Figure 11:
Objective in leaving the community of origin, according to non-migrant members of the surveyed families (n = 133, in %)



Source: Field survey 2015-2016 (INTE-PUCP, DHUMA).

Results show a very small proportion of migrants explicitly motivated by environmental factors. Rather, a large population of young adults is in search of better opportunities for work and an upward social path through mobility toward urban areas.

Martina H. Q., age 50, community of Chila Chambilla (27/10/2015):

Your son, Hugo — what does he do?

He is in Yunguyo. He says that in the countryside, the fields are small and there's no production. It's to die of hunger, and I'm going to say in the city, he says.

What kind of work does he do there?

He works with a tricycle (rickshaw).

Some 65,5% of the migrant family members do not send either money or food to their families in their communities of origin. Only 29% send money and 4,6% send food and other products. Among those who send remittances to their families, the average is 84 soles (approximately 25 dollars) a month.

Table 2:
Remittances and/or goods sent to families, by migrants' motives for leaving rural community (in %, n = 358)

Motives for leaving	Money	Food and products	Money and food	None	Total
Work	36,4	1,0	0,5	62,1	100
Studies	16,0	0	0	84,0	100
Environmental problems	23,2	14,5	2,9	59,4	100
Marriage	13,1	5,3	0	81,6	100
Other	20,0	13,3	0	66,7	100
Total	29	4,6	0,9	65,5	100

Source: Field survey 2015-2016 (INTE-PUCP, DHUMA).

Observation of the remittances sent by young adults, by reason for migration, shows that of all the reasons for leaving, those who least send remittances are those who migrate for marriage (81,6%) and studies (84%). Young people who left to work or because of environmental problems in their community of origin send a monthly amount to their families more frequently (36,4% and 23,2%, respectively). The same trend can be observed when remittances are read according to the main objective in leaving the community of origin.

Table 3:
Remittances and/or goods sent to families, by migrants' main objective in leaving the rural community (in %, n = 358)

Objectives in leaving	Money	Food and products	Money and food	None	Total
Autonomy and independence from the family	27,1	67,1	5,1	0,7	100
Economic support for the family	74,5	21,3	0	4,3	100
Solution in the face of environmental problems	27,1	57,1	12,9	2,9	100
Other (better job, studies, marriage)	10,3	82,8	3,4	3,4	100
Total	31,1	61,7	5,7	1,6	100

Source: Field survey 2015-2016 (INTE-PUCP, DHUMA).

This result is noteworthy: among the migrant members whose objective is to support their families economically, a significant majority (74,5%) sends money to relatives in the community of origin, while the absence of remittances predominates among other groups, particularly those whose motives for migrating are better jobs, studies or marriage («other»). The group that has migrated to seek a solution to environmental problems also sends money at a lower rate than the average for the sample.

Finally, 82% of the migrant members visit members of their family in the community of origin and do so with an average frequency of 12 times a year, or once a month, which is quite significant if we consider the sometimes considerable distances that require many hours of travel by bus between the locality of origin and the destination.

4. Discussion and conclusions

The socio-demographic survey shows that most of families subsist only on farming or livestock and only a limited number of them have additional sources of income. In parallel, these households have a high degree of precariousness, as well as different types of social and economic vulnerability, and for all of them environmental problems related to frost and drought that have an impact on their living conditions. A large majority of families have at least one member having migrated to cities such as Arequipa, Puno, Juliaca, Moquegua and Tacna, a few hours away by bus, and characterized by being regional urban centers that are attractive from an economic standpoint and in terms of access to health-care services and possibilities for consumption and education. To a lesser extent, some young people venture toward more distant cities, such as Lima or even La Paz or El Alto, in Bolivia.

These migrations from high Andean communities involve mainly young adults between ages 20 and 35, with a near balance between both sexes, who seek remunerated work and *a fortiori* better living conditions in urban environs. Others leave to find opportunities for higher education and social mobility. The goal of finding a solution to environmental problems in the rural community where their parents continue to live is not mentioned directly. However, if leaving to work for long periods outside of the community of origin does not respond to the need to mitigate environmental degradation in rural territories, it is not possible to exclude the fact that the benefits of migration contribute indirectly and partially to alleviating the effects of such degradation. In any case, the desire for personal autonomy related to the life stage and cycle of the migrants (most of whom are between ages 20 and 35), is the main impetus for migration and there is no family

organization based on multi residence and circular migration as an explicit livelihood for adaptation to environmental problems in rural areas near Lake Titicaca. Despite environmental problems affecting their families in the communities of origin, these migrating members cannot be considered «environmental migrants,» but are young adults in search of life plans that offer an alternative to those that predominate in rural areas, which are based on subsistence agriculture. In other words, environmental deterioration does not act as a direct determinant for expulsion from communities of origin, while cities, on the other contrary, appear as territories of attraction for young people. In fact, it is likely that the level of environmental vulnerability observed, which is significant but not critical (that could be the disappearance of any water resource), explains the low proportion of young people whose decision to migrate is motivated solely by ecological issues. However, several testimonies link environmental events (especially frost and drought) to worsening economic results, thus contributing to migration. If the environmental issue is not the main reason mentioned for emigrating from the communities of origin, its impact is recognized by families and adds a form of vulnerability to those related to poverty problems. Thereby, the effect of environmental deterioration on lower productivity coupled with high fertility, does not explain directly the migration process but accentuates the expulsion effect out of these rural territories.

The conclusions of this research are close to those of Heikkinen (2017: 85): the increasing forms of environmental vulnerability experienced by peasants in the Andean highlands are only one manifestation of a complex set of social, economic and political problems that marginalize these populations and make them more fragile and vulnerable in the face of climate change and prevent them from developing adaptive capacities based on technological access that could be made possible by political authorities. In the same sense as the conclusions of Adam (2016), it is observed that the older generations (45 years old and over) remain in the communities of origin for a question of attachment to the land and to cultural heritage in spite of consequences of environmental constraints on their daily living conditions and in particular on their well-being in the field of health.

Moreover, the results emphasize the dimensions that provide a better understanding of the dynamics of migration in high Andean communities near Lake Titicaca: the search for better living conditions, and life cycles. The former is associated with a secular process of seeking socio-economic opportunities through migration to cover their basic needs and those of their parents including paid jobs, education, access to services and consumption, among other things. The search for a supply of educational services outside of rural areas, especially through higher education, is a significant factor in

the young adults' choice. The second dimension shows that the migrants' age and family situation are extremely important variables in understanding their choice to migrate. The fact that they have finished secondary school and are part of the EAP act as determinants in the search for better working conditions outside of the locality of origin, unlike an older person, who tends to consider those things irrelevant. In fact, age can be understood as a factor that expels, and *a fortiori* if siblings or peers from the same community have already made the decision to migrate for job- and/or education-related reasons. In this regard, it is possible to speak of «adventurous» migration (Lewandowski, Urquieta & Cavagnoud 2018).

Finally, if the results show a clear distribution of family members between at least two domiciles and the reorganization of work and responsibilities between the countryside and the city, the specific issue of multiple residences should be the object of a future qualitative study based on in-depth interviews with both migrant and non-migrant family members. Family biographies over two or three generations could be the best complementary method to analyze the evolution of forms of adaptation and residential strategies through ages and life cycles within small farming families.

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