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Research Report

Gender Issues and Women's Participation in Irrigated Agriculture: The Case of Two Private Irrigation Canals in Carchi, Ecuador

Elena P. Bastidas

International Water Management Institute

Research Reports

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Summary

In the past decades, research findings have made governments as well as international and local agencies realize the important role played by women in water management. However, there is a lack of research on specific roles, tasks, and functions of women in irrigated agriculture, especially in Latin America. By considering women as a heterogeneous group among the different water user groups, this report seeks to understand the factors that influence the involvement of mestizo women in irrigated agriculture in two private irrigation canals in the province of Carchi, Ecuador. After an introduction to the study area, this report describes the users, their needs, and the different water uses of the two irrigation systems. Further, the degree of women's involvement in irrigated agriculture is defined. Finally, factors that limit women's involvement in irrigated agriculture and their participation in water user associations are identified. A typology based on "household life stage" and household composition is used to explain women's involvement in irrigated agriculture. Water user's relation to the resource and women's previous rural/urban background are analyzed for the different types of households. Women's participation in agriculture was higher in female-headed households. In households where the couple had small children, women's participation in agriculture was limited by family obligations. In households where an old couple lived by themselves, women were either too old or too sick to participate as they used to in agricultural activities. Finally, in households where the couple had no small children, women preferred to engage in other activities where they could control their income. It was also found that women with a rural background are more likely to participate in agricultural activities than those with an urban background. The study suggests that it is only by taking a closer look at the intra-household dynamics and urban/rural background that affect women in each of the different types of households, that we can properly explain women's involvement in irrigated agriculture.

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Introduction

Women, Gender, and Irrigation

Recognizing the importance of women in food production and in the provision of water for domestic use has increased in the past decades. (Roda 1991; Davidson 1993; Cleaver and Jobes 1996). It has been estimated that women are responsible for more than half of the food produced in developing countries. Research findings have also made governments as well as international and local agencies realize the important role played by women in water management (Davis 1996; Johnson and Krogman 1993). However, there is still a lack of research on specific roles, tasks, and functions women have in irrigated agriculture, especially in Latin America.

Most of the evidence regarding irrigation development experiences comes from the African and Asian countries. One of the common assumptions made regarding farmers and, therefore, irrigators is that they are predominantly male, which leads to the assumption that farm household resources and labor are effectively controlled and allocated by males. Research in the African (Carney 1988; Jones 1986; Zwarteveen and Neupane 1997) and Asian (Hart 1992; Zwarteveen 1996) systems has focused on verifying this assumption, which has guided irrigation policies, planning, and design. These studies also have shown that the failure to recognize gender issues affects the agricultural productivity of irrigated crops negatively, and that women's lack of independent access to, and control of, land and water threatens household food security. Although these studies provide valuable information and examples, we cannot expect that the recommendations and lessons learnt from them would be directly applicable in the Latin American context.

This report is aimed at understanding the factors that influence the involvement of mestizo women in irrigated agriculture in two irrigation canals in the province of Carchi, Ecuador. For this purpose, women are considered as a heterogeneous group among the different water user groups. As a heterogeneous group, their involvement in irrigated agriculture as well as their needs and responsibilities will vary as these are influenced by different social variables. A typology based on "household life stage" and "household composition" is used to explain women's involvement in irrigated agriculture. Women's previous background (rural or urban) is analyzed for the different types of households.

The objectives of this report are first, to determine the users, their needs with respect to the resource, and the different water uses of two irrigation systems, Garrapatal and El Tambo, located in the province of Carchi, Ecuador; second, to determine the degree of women's involvement in irrigated agriculture and decision making, and third, to identify the factors that limit women's involvement in irrigated agriculture and their participation in water user associations.

Women and Irrigation in Latin America

Latin American farming systems were first classified by Boserup (1970) as "male farming systems" in contrast to the African countries, where it is estimated that women farmers raise as much as 80 percent of the crops. The underlying argument for this classification was that in systems characterized by settled farming and use of the plough, usually men do more work than women. Deere and Leon De Leal (1982), who analyzed studies from the Andean regions of South America with respect to women and their productive activities, later challenged this classification. In their study, they concluded that the term "family farming system," would be more appropriate than "male farming system." They found that women, in fact, do participate in agricultural activities, even if men do the majority of fieldwork.

According to Brydom and Chant (1989), beliefs that usually emerge based on religion and other cultural aspects are crucial in determining the male and female roles in society. In Latin America, the predominance and influence of the Hispanic colonial values and the Catholic Church have shaped the male and female roles in the mestizo communities, limiting women to the domestic or the reproductive sphere (Brydom and Chant 1989). Despite this fact, research done in Ecuador and Peru shows that the involvement of women in agricultural production and irrigation activities is higher than it is generally assumed.

A study done by Villalobos et al. (1993) in the community of Camiraya Molino in Puno, Peru shows that in most cases, women are more involved than men in the management and use of water for irrigation purposes. Women participate as much as men even in the maintenance, cleaning, and construction of the irrigation systems. One of the reasons for this was attributed to the increase of male migration to the cities, leaving women in charge of production activities. The same study showed that although women's involvement in agriculture and irrigation activities was high, women's participation in water user association meetings was low. Jacome and Krol (1994) found similar results in the mestizo communities of Guano, Ecuador. Because of the difficult economic situation, men migrate to the nearby cities to work as drivers or construction workers to supplement the household income. Only the old men and farmers who have enough land stay back to do agricultural work. In both studies, the authors found women's involvement in irrigated agriculture varied according to the migration of men. According to Lynch (1991), the female participation in the construction and maintenance of irrigation systems varies widely in the Andes. She found that in Cajamarca, Peru women worked only for short periods on small jobs, while in Puno, Peru they comprised more than half of some work crews.

Study Area

The study area is part of the El Angel River water use area, which is part of the Mira River hydrological system, one of the large watersheds in Ecuador. It is located in the northern part of the country in the province of Carchi, near the Colombia border (see Annex). Its strategic location has a direct impact on agriculture, forestry, and the consumption centers in Ecuador and Colombia. The sub-cuenca[1] of the El Angel River begins in the high paramo[2] of the "El Angel

[1]The term *cuenca* is used in this report to refer to the basin of a river or a watershed.

[2]High, bare, and cold regions of tropical South America.

Ecological Reserve." From this point, numerous streams form the El Angel River and 11 different irrigation canals, which provide water for agriculture. These irrigation canals are managed by private water user associations (Nuñez 1997).

These canals and the El Angel River cross through 3 distinct agro-ecological zones in their trajectory toward the Mira River. In the upper zone (2,400 meters above sea level [masl]), agricultural production is characterized by livestock, basic grain cereals (wheat and barley), and potato (Vallejo 1997; Arce et al. 1996). The middle zone (2,000–2,400 masl) is warmer and drier, and most agricultural production is dependent on irrigation. Maize, wheat, and barley are the common cereals, horticultural crops, especially bean, and gardens with fruits (mainly avocados) tend to predominate over livestock. In the lower zone (1,700–2,000 masl), sugarcane and horticultural crops are the main agricultural products (Vallejo 1997).

Agriculture represents the most important sector of Ecuador's economy. It contributes approximately 17 percent of the total GDP and up to 40 percent of the total employment of the Ecuadorian labor force. Irrigated agriculture represents 27 percent of the total area under cultivation. Eighty percent of this irrigated land corresponds to irrigation systems which are managed by private water user associations located mainly in the Andes (Whitaker 1990).

Irrigation in the Area

Most of the private canals in this area, as well as the other irrigation systems found in the Ecuadorian highlands, have a long history. According to Le Goulven, Ruf, and Ribadeneira (1989), irrigation systems in the Andean areas were known long before the arrival of the Spaniards (1530) and perhaps before the arrival of the Incas from Peru (about 1470). Most of the existing networks were built between the seventeenth and eighteenth centuries, when the rich landowners were able to make the native labor force dig and maintain canals that were regularly destroyed by bad weather, overflows, and earthquakes.

In the nineteenth and twentieth centuries, especially in the area of Carchi, land was gradually partitioned due to social movements, thus causing changes in the use of water. On the one hand, the largest haciendas were divided among the descendants, creating problems in the division of water, which were settled by the construction of new canals; on the other, the huasipungueros[3] claimed their water rights, which were justified by their crucial participation in the construction and maintenance of the irrigation system (Le Goulven, Ruf, and Ribadeneira 1989).

Although the process of land partitioning and distribution had already started in Carchi, the Agrarian Reform of 1960–1970 reinforced this movement. In 1966, the National Water Resource Institute (INERHI) was created. Its main purpose was to deal with the conflicts that arose between irrigation network owners and users. The authority of this institute was strengthened when the water resources were nationalized in 1972. INERHI was the institute responsible to check and grant water concessions. Therefore, water users had to declare their former water rights to be legalized (Whitaker 1990). In 1994, as a result of the modernization policies in the country, the responsibilities of INERHI were taken over by the Regional Development Corporations, one of which is the Regional Corporation for the Northern Sierra (CORSINOR), which is in charge of managing water resources of the northern highlands (Sotomayor and Garcés 1996).

[3]Huasipungueros are peasants who worked in the big haciendas. The landlord gave a huasipunguero and his family a plot of 2 or 3 hectares of land (sometimes more) to sustain themselves. In exchange, the huasipunguero had to work 4 or 5 days of the week in the haciendas. In some cases, they could use a yoke of oxen to plough their fields and receive water turns during the weekends.

Water User Associations

The construction, maintenance, and management of private irrigation systems and irrigated areas are the responsibilities of the users and their water user associations organizations, "Juntas de Aguas" that are formed by groups of farmers who have been granted legal rights to use the water of private canals. Each association's board is formed by a president, vice-president, treasurer, and secretary who are elected every year. The associations have regular meetings during the year to plan the maintenance and management of the canals, and to solve conflicts between users, or other types of problems related to the irrigation system. When water from the same canal feeds several distant areas, farmers organize into several sub-juntas, to better deal with maintenance and management. The presidents of the sub-juntas form the board of the water user association for the main canal.

The maintenance work of the irrigation systems is a challenge because of the infrastructure of the canals. The old facilities consist of winding earth canals dug on the mountain slopes, which can often disappear into long tunnels and can carry flows of about 500 l/sec. The water intakes are rustic (water diverted with stones) and, therefore, unstable. All along the flow, the canals cut across each other and become entangled, delivering water through proportional dividers. Generally, gravity irrigation techniques are applied, as they are well adapted to the topography of the area (Le Goulven, Ruf, and Ribadeneira 1989).

Two Canals

Two private canals, Garrapatal and El Tambo, were selected to be studied in detail among the 11 irrigation systems. The selection of these canals was based on the infrastructure, agricultural patterns, and organizational structure of the two systems. Table 1 summarizes the characteristics of some of the systems.

Garrapatal takes water from El Angel at an altitude of 2,665 masl (corresponding to the upper zone of the sub-cuenca) and in its course, it delivers water to 8 different irrigation areas in the middle zone of the sub-cuenca (La Cocha, Grandeza Nacional, San Nicolas, La Providencia, Loma Seca, San Marcos, Playa Rica, and Uyama). The users from these irrigation areas are organized into 11 sub-juntas whose presidents form the water user association for the main canal.

Water intake for the El Tambo canal is located at an altitude of 3,200 masl. In its course, the canal crosses the middle zone but it delivers most of the water to irrigation areas located in the lower part of the sub-cuenca (San Pablo de la Cangahua, San Francisco, Torrealba, Potrero Grande, and El Tambito). Most of the users who benefit from this canal live in the community of

TABLE 1.
Characteristics of some of the irrigation systems, including El Tambo and Garrapatal canals.

Characteristics	San Vicente	El Tambo	Galera	Cunquer	Huaquer	Garra-patal	Vtte. Baños	Higue-rón
Elevation at water intake (masl)	3,700	3,200	1,670	3,220	2,860	2,665	1,580	1,590
Length of canal (km)	47.90	26.10	3.20	57.20	30.36	10.77	1.23	1.56
Average farm size (ha)	-	5.8	-	-	-	2.8	-	-
Irrigated area (ha)	350	416	-	-	150	497	-	-
No. of irrigated areas	7	8	1	4	2	6	1	1

Source: Sotomayor et al. 1997.

El Tambo, and in contrast to Garrapatal, the organization is centered around one water user association.

The average crop production for El Tambo (1.15 t/ha) and Garrapatal (1 t/ha) has been standardized taking bean as the base crop (table 2). The standardized gross value of production per hectare is higher in El Tambo than in Garrapatal since in El Tambo, anise is one of the principal crops and has a better sale price than bean. El Tambo also has a better gross value of production per m^3 of water (Molden et al. 1998) since water supplied for the area is lower than it is for Garrapatal (Sotomayor et al. 1997).

Table 3 shows the production patterns for summer and winter crops. In both systems, the main crop is bean. In Garrapatal, bean and maize account for approximately 74 percent of the area under cultivation, while in El Tambo, bean and anise cover 79 percent of the area under cultivation.

TABLE 2.
Performance indicators of El Tambo and Garrapatal canals.

Performance indicators	Garrapatal	El Tambo
Production (bean) (t/ha)	1	1.15
Standardized Gross Value of Production per season ($/ha)*	1,292	1,508
Standardized Gross Value of Production per unit of water supplied ($/$m^3$)	0.16	0.32

*The average exchange rate for 1996 was US$1 = S/. 3,210.
Source: Sotomayor et al. 1997.

Water Allocation

In both canals, as well as in most of the other irrigation systems in the area, water is allocated and distributed in terms of water concessions and rotation schedules, which were established when the associations were first formed during the 1970s. During that period, concessions and turns were approved by the Water Agency of the Ministry of Agriculture and supervised by the technicians of the ex-INERHI. The criterion used to establish the water turn is based on the amount of water supply (concessions) for each branch, time, and the irrigated area. In some cases, farmers receive 12 hours of water per hectare fortnightly, while in other areas, the water turn corresponds to 6 or 7 hours per hectare once in a week. In any case, water turns are based on theoretical concessions that rarely correspond to the actual water supplied. This is illustrated in detail in Sotomayor et al. 1997.

TABLE 3.
Crop pattern for Garrapatal and El Tambo irrigation systems, summer 1996 and winter 1996–1997.

Crop	Summer 1996[a]				Winter 1996–97[b]			
	Garrapatal		El Tambo		Garrapatal		El Tambo	
	ha	%	ha	%	ha	%	ha	%
Bean	183	39	162	47	209	40	308	63
Maize	157	34	41	12	186	35	18	4
Anise	0	0	93	27	11	2	105	21
Tomato	34	7	0	0	37	7	0	0
Wheat	11	2	12	4	11	2	8	2
Onion	0	0	4	1	30	6	20	4
Others	81	18	32	9	43	8	29	6
Total	466	100	344	100	527	100	488	100

[a]Summer/dry season lasted 11 weeks. [b]Winter/wet season lasted 15 weeks.
Source: Sotomayor et al. 1997.

Methodology

Data for this study were collected during two summer field visits (June–August 1996 and May–August 1997). To achieve the proposed objectives, a combination of qualitative and quantitative methods was used to gather information. During the first visit, historical facts, focus groups, and gender analysis (Feldstein and Poats 1993) were used in a participatory way to obtain qualitative information. Mapping and stakeholder analysis were also used to identify the different users of the systems and their primary needs.

During the second visit, household interviews, case studies, and focus groups were used to obtain quantitative information. Household interviews were based on a random sample taken from the rosters of the two water user associations. For this part of the study, households of male and/or female farmers who owned at least one irrigated plot of land were taken into consideration. For Garrapatal, three subsamples were taken corresponding to farmers in the head, middle, and tail end of the canal. In the case of El Tambo, a subsample was taken corresponding to the major irrigation area. Sixty interviews were conducted, 15 from each subsample. After the interviews were completed, focus groups were used to clarify and validate information from the interviews. Based on this information four household types were identified according to "life stage" and "household composition." Case studies were conducted to obtain detailed information on the different types of households.

For the purpose of this study, a "household" is defined as a residential unit, where the members share domestic functions and activities—a group of people who "eat out of the same pot" or who "share the same bowl" (Brydom and Chant 1989). Individuals who are not physically present but are contributing to the household are also considered household members. Although membership of a household implies at least a minimal degree of interaction with others in the unit, it cannot be assumed that such interaction involves equality or even cooperation among individuals. According to Kabeer (1985), it is common to find significant disparities in terms of the inputs, benefits, and activities of various household members, which are influenced by variables such as age and gender.

The term "life stage" can be defined as the overall size and composition of a household. The concept of different life stages for individual households should not imply that the household development follows a predetermined pattern; that is, although many households have similarities, not every household will originate identical life stages (Murray 1987; Kabeer 1985).

Users and Uses

This section presents an analysis of how the relation between the user and the resource determines who has control over, or who is more likely to have access to, water from the irrigation canals. Through participatory mapping, points where water was used along the canals were located. People were grouped into two broad categories according to their relation to the resource: 1) direct users or those who use water for crop production (irrigation) and 2) indirect users or those who use water for activities other than irrigation (table 4).[4]

Direct users

This group includes farmers (both men and women) who have been granted legal rights and concessions to use water from the canals for

[4]Since these canals were constructed as irrigation systems, the terms *direct* and *indirect* reflect whether water is being used for this purpose or for an alternative use.

TABLE 4.
Uses and users of water from Garrapatal and El Tambo canals.

Relation to the resource	Uses	Users
Direct users	Irrigation	Field owners (men and women) Share croppers (mainly men) Leasers (men and women) Paid workers (men and women)
	Washing clothes	Women
Indirect users	Bathing	Men, women, and children
	Home consumption (drinking, cleaning, etc.)	Women, men, and children
	Watering animals	Mainly women and children

irrigation. As mentioned earlier, land in the study area has been owned by a few families, in the form of big haciendas. Due to pressure from social movements and the Agrarian Reforms of the 1960s and 1970s, part of the land was partitioned and sold to groups of farmers, while other parts were given to the peasants (huasipungueros) in return for their work. Before the water law of 1972,[5] land and water rights were acquired independently of one another, which enabled some farmers in the upper zone of the watershed (where rain-fed agriculture predominates) to buy land[6] without acquiring water concessions. In the same way, some farmers in the lower valleys bought water rights without having to buy more land than they already owned. In a focus group, one of the farmers from the upper zone explained the view of his fellow farmers:

> *We think that water rights and concessions have to be redistributed. When land was partitioned, our ancestors didn't fight to get water for irrigation because they didn't need it. With the rains, they had enough water for agriculture. Now the climate has changed, we can no longer predict when it will rain. Agriculture becomes a riskier business every year. It's not fair that farmers in the lower valleys use all the water from the canals.*

Recently, changes in weather pattern and population have started generating conflicts among the communities in the upper zone (who have recently felt the need for irrigation) and communities in the lower valleys (who have always benefited from this resource). Farmers in the upper zone want to benefit from the canal water. But, the farmers who already have water concessions indicated that the amount of water is not enough for the production of crops, especially during the dry season (June, July, and August) and they complained that during such periods stealing of water increases. It is common to find water being diverted to fields of farmers who do not have water concessions. Another problem is that farmers who live along the canals do not leave the established distance (4 m) between the canals and their fields. In this way, they use the seepage of the soil near the canals to grow their crops and hence the walls of the canals get damaged.

[5]The water law of 1972 states that water rights are granted to the owner of the land by just showing the corresponding land title. Concessions for the use of water are assigned proportionally to the amount of land owned by the farmer.

[6]In the case of the huasipungueros, land was given without the water rights.

Direct users can be further classified as field owners, sharecroppers, leasers, and paid workers. These categories are not exclusive of each other; the household members can fall into one or all of these categories depending on their means of livelihood.

Field owners. This category includes huasipungueros or their descendants (farmers who originally bought land from the owners of the haciendas) and farmers who had come from other towns and bought land in later years. Farmers in this group form the water user association and have the responsibilities of construction, maintenance, and management of the irrigation systems.

Some of the wealthier farmers in this group have moved with their families to the cities. These farmers either lease their land or engage in agriculture with sharecroppers. Usually, they visit their properties on weekends. Since the whole family lives in the city, women are not involved in agriculture; men manage agricultural activities.

Sharecroppers and lessees. Farmers who do not have enough land for agricultural purposes but have the necessary resources, engage in sharecropping or leasing. In the case of the sharecroppers, there are several types of arrangements that work according to specific situations. Generally, the owner puts up the land, pays for the land preparation, and bears half the cost of pest control. In exchange, the sharecropper puts up labor, pays for half the cost of pest control, and all the other necessary inputs. Each farmer gets half the harvested product. The arrangements on paying the water fees and the maintenance cost of the canals vary depending on how long the land is leased. If the sharecropping is for one cropping season, usually, the owner takes care of the cost. When the sharecropping is for several seasons, the cost is split between the owner and the lessee.

Paid workers. For farmers who neither have enough land nor the resources, wage labor represents an important way to earn their livelihood. Men and women are hired to work in the fields. According to a hacienda owner, women are preferred during planting and harvesting because they do a better job in these activities. While men were paid US$2.50 per day of work, women were hired for US$2.00. This difference in wages, according to the farmers, is because the work that women perform is not as heavy as the work that men do.

Although this common perception can be easily challenged, it is used to justify the lower wage paid to women. Women accept this disparity due to cultural norms, which define gender roles in the mestizo culture.

Indirect users

The second group includes the legal users and also people living along the canals. People use canal water for home consumption,[7] bathing, and washing clothes because they do not have access to tap water or the systems do not work appropriately. A woman user explains:

> *This is the third time during this week that I have come to the canal to get water for the house. Although we have the installations for tap water, the system never works. Some people say that it's because the tanks that collect the water are being repaired but this happens all the time... so we are forced to use this water for everything. I also come to wash clothes here and sometimes my children come with me to take baths in the canal ...*

Poor quality of water is one of the main problems faced by the users. In the area, waste is usually dumped into canals and rivers, even though everybody is aware of the uses of water

[7]The water law of 1972 legally protects use of water for these purposes.

from the canals. In the case of El Angel River, most of the waste from the city of El Angel (6,000 people) goes to the river, including the waste from the city hospital. About this situation one of the users comments:

> *We know waste from the different communities gets thrown into the canal. We have even found dead animals in it. We know the water is contaminated, but what can we do? We can't afford boiling the water before using it, it consumes too much firewood or gas.*

Children are the worst affected by this situation. According to the nurses who work in the local health dispensary, the incidence of diseases caused by parasites are high. They attribute this problem to the meager sanitary conditions and poor water quality. The need for clean water is critical for women since it is their responsibility to provide water for the household and the children.

It is the responsibility of the municipalities and the local governments to provide clean water to the communities and small towns. But in reality, the local governments take action to solve the problems only if there is a group of well-organized people to exert political pressure. Since petitions backed by an organization stand a better chance of being heard by the local authorities, water user associations are crucial to solve problems of this nature. In one case, a sub-junta of the Garrapatal canals, which consisted of a group of 42 farmers, persuaded the board of the water user association to lobby for them to get tap water from the municipal authorities.

Gender Division of Labor

The needs, tasks, and responsibilities for the groups described above are influenced not only by the users' relations to the resource but also by the cultural determinants. Following the Triple Roles Framework presented by Moser (1989), male and female roles are categorized as productive, reproductive, and community management, although the boundaries between productive and reproductive spheres are not always clear.

Productive roles

These refer to activities that generate income. Those activities related to subsistence farming are also included in this category. Although subsistence farming is essentially production for use, it displays similarities to income-generating agricultural activities and, in times of surplus, becomes production for exchange or trade for other agricultural products or resources like labor.

Reproductive roles

These involve the daily domestic activities (related to child bearing and rearing responsibilities) like cooking, cleaning, washing, and so on. They also include the transformation of goods and services for household use and welfare.

Community management roles

These cover the collective aspect of production, community organization, and the provision of items of collective consumption. Table 5 presents a picture of what are commonly referred to as male and female activities, tasks, and responsibilities, as defined by the mestizo culture. Emphasis is given to productive and reproductive roles. The table shows the division of labor based on gender according to the mestizo culture, which does not necessarily represent what people actually do, but the norm in the area (what people ought to be doing). Most people (90 % of men and 70 % of women in household interviews), when asked about the general division of labor in the area, differentiated the tasks on the basis of the physical strength required to carry them out. Male tasks were considered as those that require more physical strength while typical female tasks were those that require less physical strength.

Men do most of the fieldwork, while women help in activities like planting, weeding (when it is done by hand), harvesting, selection of seed, threshing, and storing the product. Sometimes women cook in the field for family members and paid workers. This is usually done in times of planting and harvesting. Looking after the small animals, which include guinea pigs, chickens, and pigs, is the responsibility of women. Small animals are usually for home consumption. Women have the control of small animals and can decide to sell them in need of money. Men and women both are responsible for the care of livestock; both contribute to feed, water, and herd the cows while women usually milk the cows. When there is enough milk, women sell part of the production and take control over the cash. Reproductive activities are mainly women's responsibilities.[8]

TABLE 5.
Gender division of labor.*

	Activities	Women	Men	Both
Agricultural activities	Land preparation		✓	
	Plowing		✓	
	Planting	✓		
	Weeding by hand	✓		
	Weeding with hoe		✓	
	Fertilizing		✓	
	Hilling		✓	
	Fumigating		✓	
	Harvesting			✓
	Irrigation		✓	
	Storing			✓
	Threshing			✓
Rearing of small animals	Feeding	✓		
	Forage gathering			✓
	Watering	✓		
Rearing of livestock	Milking			✓
	Watering			✓
	Feeding			✓
	Forage gathering			✓
	Herding			✓
Reproductive activities	Preparing food	✓		
	Cooking	✓		
	Fetching water	✓		
	Cleaning	✓		
	Washing	✓		
	Gardening	✓		
	Child caring	✓		

*This table was constructed based on the information obtained from four focus group meetings, and it represents the general division of labor based on mestizo cultural norms. The information in the table also reflects the results found from household interviews, when people were asked about the general division of labor in the area.

To compare the description of the roles of men and women based on the cultural or the prescribed norms and what people actually do in reality, a focus group of 21 women was selected. It was found that gender roles tend to be more complementary. Women were often involved in field activities more than they acknowledged when they were first asked. The women in the group were asked explicitly about their participation in field activities, which are considered mainly male activities. Results showed that almost half the women (47%) worked with the hoe also when they worked in the fields, 41 percent irrigated, and 23 percent applied pesticides. Similar information was obtained through household interviews, when women were asked to describe their activities during a typical day. Most women considered themselves "helpers" when referring to productive agricultural activities and did not acknowledge their participation in the field, unless they were asked explicitly. The following response from one of the women illustrates this.

> *I wake up in the morning, prepare breakfast, get the kids ready for school, clean the house and cook lunch. When lunch is ready, I have to prepare to go to the field where my husband and son are working. There we have*

[8]Gender roles did not vary much between the two irrigation systems because of the different cropping patterns. Unlike in the African systems, where women are mostly in charge of food crops while men are in charge of cash crops, in this area, the roles of men and women are more complementary, and division of labor in terms of cash or food crops is not that relevant.

lunch and I help out. Sometimes we come back together, other times I have to get home before, to do the housework and to take care of the kids. When it is not harvest time, I do whatever is needed, sometimes work with the hoe and sometimes help irrigate, weed, ... If my older daughter is at home, I stay in the plot from 11:00 a.m. to 4:00 p.m.

Women's Involvement in Irrigated Agriculture

The involvement of women in irrigated agriculture was measured in two ways. First, by the degree of women's participation in agricultural production, and second, by the degree of their involvement in decision making, regarding the benefits derived from crop production. During the household interviews, women were asked explicitly about their participation in field crop activities. The answers fell into three categories (figure 1).

No participation

This group consists of women who do not work in the fields. Almost 20 percent of the women in the sample came under this category. They participate in production activities indirectly, for example, by preparing food for paid workers.

Semi-participation

In this group we find women who participate in field activities mainly during peak seasons, when labor is scarce and extra help is needed from all members of the family (for example, planting and harvesting seasons). Sixty percent of the women fell in this group.

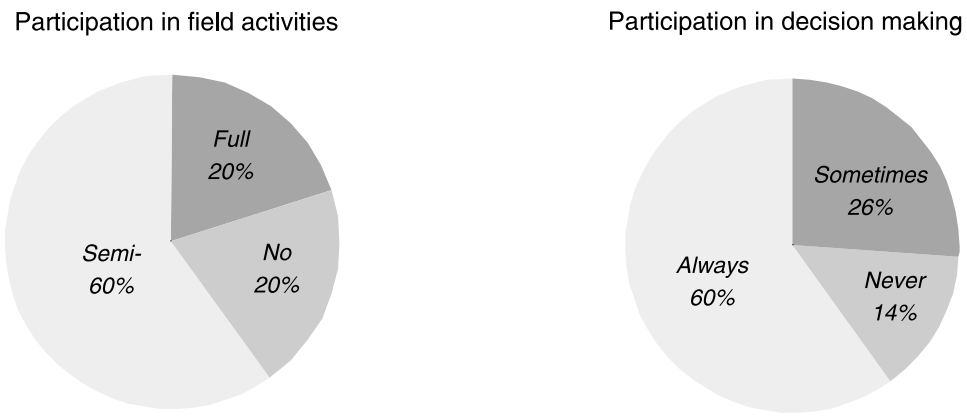
Full participation

Women in this group participate in field activities almost every day. Twenty percent of the women in the sample mentioned they worked in the fields after finishing with household chores.

Women's involvement in decision making include decisions regarding the benefits obtained from irrigated agriculture—the amount of the crop to be sold, the amount to be allocated for home consumption, the ways in which the money should be spent, etc. Women's responses also fell into three groups (figure 1).

- *Never consulted.* Fourteen percent of the women reported that they were never consulted by their husbands on decisions

FIGURE 1.
Women's participation in field activities and decision making.

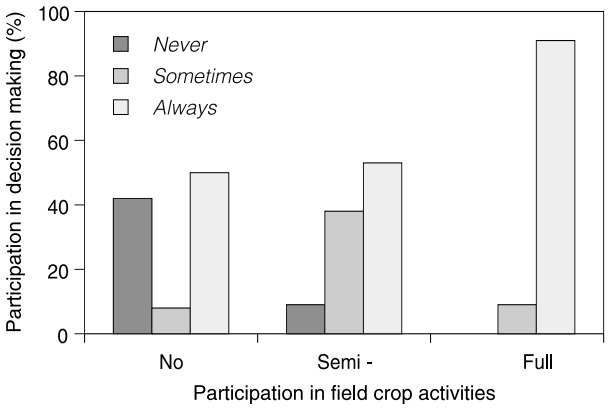


related to agricultural benefits. Their husbands controlled agricultural production and the benefits derived from it.

- *Sometimes consulted.* Women in this group mentioned that in some cases they were consulted by their husbands. Twenty six percent of the women fell in this group.
- *Always consulted.* More than half (60%) of the women in this group reported that they shared decision making with their husbands.

It was found that there is a positive relationship between women's participation in agricultural activities and their involvement in decision making. Women who participate more in agricultural activities tend to have greater influence on decision making. Chi-Square Test showed differences among the groups to be statistically significant (p=0.004) (figure 2).

FIGURE 2.
Women's participation in decision making categorized by participation in field activities.



Household Composition and Life Stage

The factors influencing women's participation in agricultural activities varied according to four different types of household. The households were characterized in terms of life stage and household composition.[9]

Type 1: Households with young couples with children less than 14 years old[10]

Type 2: Mature couples with children of 14 years or more

Type 3: Households with old couples

Type 4: Female-headed households

Table 6 summarizes the characteristics of the different types of household.

TABLE 6.
Characteristics of the four types of household.

Characteristics	Household type				
	All households	Type 1	Type 2	Type 3	Type 4
Average age for husband/wife	57 / 52	47 / 41	60 / 57	70 / 65	— / 54
Average number of household members	3.8	6	4	2.6	2.5
Average number of hectares	3.46	2.77	4.75	3.35*	3
Household type (%)	100	40	27	23	10

*Without the two farmers who possess more than 9 hectares of land, the average number of hectares drops to 1.9 ha.

[9]Among the 60 households interviewed, 3 cases were found in which the male head was a widower and had not remarried. In these cases, a female member of the household had assumed the household chores and responsibilities.

[10]The criterion for selecting the age of 14 to differentiate between the two groups was the availability of labor. At the age of 14, approximately, children work as adults in the fields.

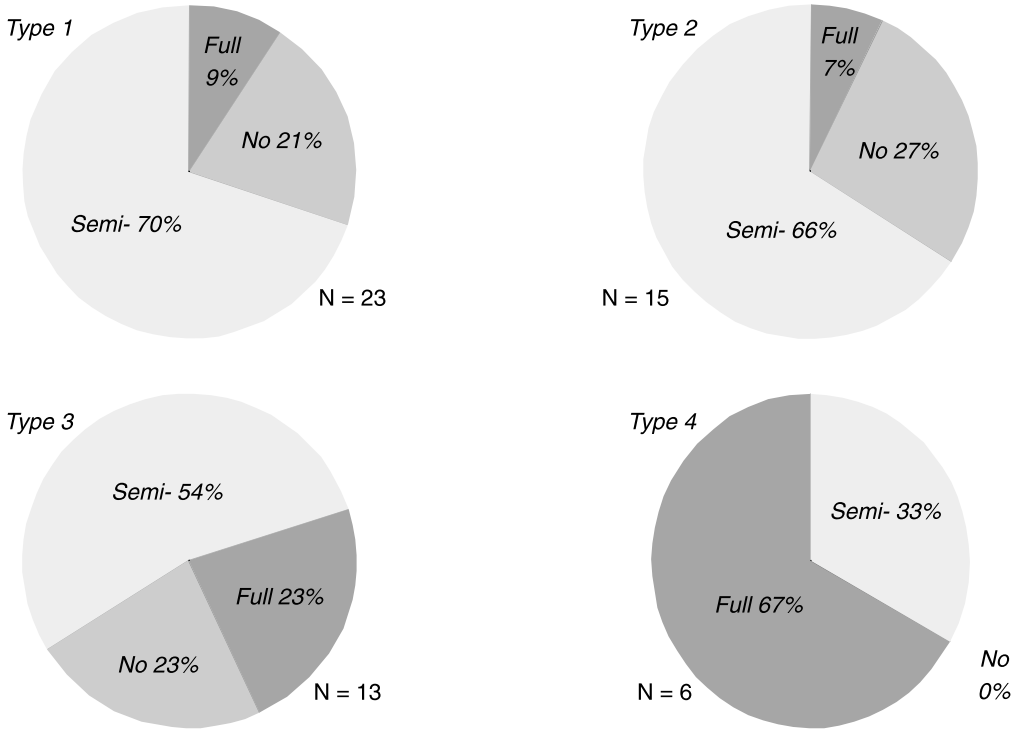
Type 1: Households with young couples with children less than 14 years of age

The majority of the households in the sample come under this group (40%). The age of men ranges between 31 and 63, and of women, between 22 and 57, with means of 47 and 41, respectively. This category includes young couples with small children, and families in which mature couples still have children less than 14 years old. The number of household members varies between 3 and 10; 59 percent of the cases have 6 or more members.

Women in this group spend most of their time in reproductive activities like taking care of the children, cooking, cleaning, washing clothes, and also in some productive activities which include rearing of small animals. This limits women's opportunities to work far from the house. In general, the agricultural plot and the house are not in the same plot, making it difficult for women to involve in field activities. In 70 percent of the cases, women in this category participate in agricultural activities mostly during peak seasons, when labor is scarce and their husbands need more help in the fields, in planting and harvesting seasons (figure 3). In 9 percent of the cases, where women fully participate in field activities, a female member of the household (elder daughter or grandmother) helps with the household chores and reproductive activities. In terms of agricultural decision making, only 13 percent of the women are never consulted.

Some of the women (41%) in this type of household engage in activities other than agriculture as part of their livelihood. There are jobs they can do in-between the household chores, including: weaving, sewing, or managing a small *tienda* (shop). Among the activities mentioned, the most popular is weaving.

FIGURE 3.
Women's participation in field activities by household type.



Merchants from Otavalo give orders to women to make woollen sweaters on contract. Otavalo is a small city where arts and crafts from the Andes are sold to tourists. The contractor provides the wool and other materials needed and collects the finished sweaters fortnightly. They pay US$3.75 per finished sweater. These activities give women an opportunity to earn extra money. Women have control over this money as well as the money obtained from selling small animals.

Type 2: Couples with children of 14 years or more

Households in this category include mature couples with children over 13 years old. The average age for men is 60 years and for women, 57 years. One-fourth of the households fell into this category. The number of household members ranges between 3 and 8. Eighty two percent of the households have 5 or fewer members.

In 12 percent of the households of the study, we found cases where a daughter of the head of household was a single mother and was living with her parents. The majority of such cases fell into this category (57%). The difference between this group and type 4 household is that the young single mothers in this group are not heads of households, they are still members of their parents' household. In this group, we find the highest percentage of women who do not participate in field activities (27%) (figure 3). Sixty seven percent help out partly and only 7 percent have full participation. Women get the opportunity to engage in other activities to earn money as their sons usually help with crop productive activities. Sixty three percent of the women engage in activities including hired labor, weaving, managing a small store, sewing, working as teachers and others. In terms of decision making regarding agricultural activities, one third of the women in the group are not consulted by their husbands, the highest percentage among the 4 groups.

Type 3: Households with old couples

Twenty three percent of the sample corresponds to this type of household. These are households where the couples have finished with the responsibilities of raising children. In 57 percent of these households, the old couple live alone. The rest live either with a son or a daughter, who helps support the couple, and/or grandchildren who help out with household chores. The couples' ages range between 62 and 84 years with a mean of 70 for men, and between 55 and 80 years for women, with a mean of 65 years.

Most of the couples in this group (86%) characterize themselves as old people, who are in their last years of life and sick and, hence cannot work in the fields as hard as they used to. The amount of land these couples own ranges from 1 to 3 hectares.[11] While farmers in all other types of household produce mainly for the market, farmers in this group emphasize the importance of their plots for home consumption. Farmers in this group sometimes receive help from relatives as either cash or basic products. When there is a need for cash, men and women work as hired laborers provided they are not sick. Forty four percent of men and 14 percent of women mentioned that occasionally, they work as hired laborers.

This group is mostly formed by the old huasipungueros. Women's participation in field activities is relatively high (figure 3). The main reason why women do not participate in agricultural activities is that they are either old or sick. All the women in this group mentioned they share decision making with their husbands.

Type 4: Female-headed households

This group includes households in which the male head is away or has died. Women have children who are either divorced or separated. Ten percent of the sample corresponds to this type of household. The age of the women heads of the house-

[11]Two of the farmers in this group have more than 9 hectares of land.

holds ranges between 37 and 64 years with a mean of 54. The number of members ranges between 3 and 5. In 5 of the 6 cases, households were in a mature household life stage; the majority of children had either migrated or formed their own families.

Women in this group spend most of their time performing and managing agricultural activities (figure 3), in addition to the reproductive activities. Although women as heads of the households make all the decisions regarding agricultural management, it was found that in no case did women engage in agriculture by themselves. They would find a male sharecropper who is either a relative or a farmer in the community, to engage in agriculture. This situation forces women to share the decisions regarding the agricultural production with the sharecropper. These decisions include what and how much to grow, as well as when and where to sell the product. Sharecropping arrangements vary in each situation, but generally, the woman provides the land, cash for inputs, and some labor (own and family), while the sharecropper provides labor and also part of the cash for inputs.

One of the chief reasons that deters women from engaging in crop production is the difficulty they face to control all aspects of agricultural production. According to the women farmers in this group, there are certain tasks that require the presence of a man. Although women could hire labor, they said they could not trust paid workers to look after their interests in the same way a sharecropper would. One of the women explained:

> *If I get the water turn at night and I'm working alone, I simply lose the water. It is dangerous for us to go out in the middle of the night to irrigate, God knows what might happen! Paid workers won't work at night, so I have to look for a male sharecropper. Men can irrigate at night and make sure nobody is stealing the water..... Also, when the canal needs to be repaired, farmers have the obligation to go and repair the damage. We don't do that type of work, so we hire workers. The problem with paid workers is that if the owner is not present they don't do a good job.*

In contrast to the studies cited in the first part of this paper (Villalobos et al. 1993; Jacome and Krol 1994), women here refuse to do maintenance work in the canals. This is probably because they can still hire male workers for this job, since male migration is not very remarkable.

Women's Background: Urban or Rural

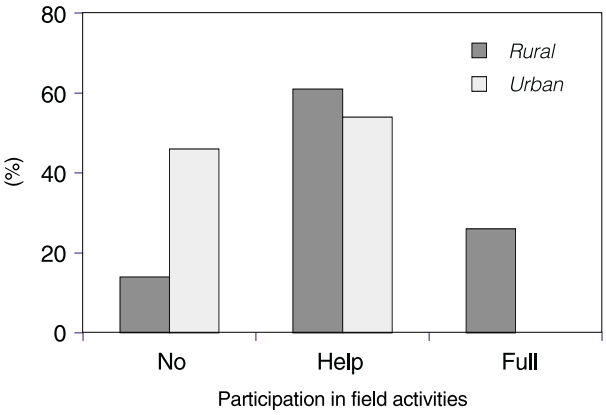
Women's background—either rural or urban—is an important variable in their participation in the field activities. Women who had been raised and had lived on small farms were more likely to participate. One of the women interviewed remarked:

> *We all have to help in agriculture, men and women. It is a lot of work so we both go to the field; while he forms the beds I plant, when he works with the hoe I take out the weeds with my hands... You need two people to irrigate so I help him with that too. I have always helped in the field, even before getting married.*

On the contrary, women who have had a previous urban experience, who had been raised in a city, sent to school, or worked in an urban area, were less likely to participate in the field activities. They considered agriculture as a man's work and preferred to do something else to earn, hire workers to help their husbands in the field.

Twenty two percent of the cases corresponded to women who have had previous urban background. None of the women within this group fully participated in field activities: 46 percent did not work in the field and 54 percent only helped out. Chi-Square Test showed differences among the groups to be statistically significant (p=0.015) (figure 4).

FIGURE 4.
Women's participation in the field activities on the basis of their rural or urban backgrounds.



Participation of women in the water user associations

As mentioned before, many of the problems related to irrigation are solved directly by farmers; at home or at work. This is partly due to a weak organization, which has forced male and female farmers to find informal ways to deal with their problems. According to the statutes of the Garrapatal and El Tambo associations, members should meet once in two months to discuss problems, make decisions, and collect irrigation fees, and once a year to elect new board members. This is hardly the case. In El Tambo, farmers meet less than twice a year and the previous board members held office for almost 8 consecutive years (1989–1996). It seems that the only occasion that brings farmers to meetings is when the irrigation system ceases to function and an urgent action is needed. The problems that required action from the organization were, in many cases, dealt with by the board members, who, according to the majority of the farmers, were people they could trust. In Garrapatal, because the association includes 11 sub-juntas, farmers are forced to meet more often. In some sub-juntas, farmers meet every month. The junta general[12] usually meets twice a year to organize the cleaning of the main canal. The corresponding sub-junta deals with problems that arise in the different irrigation modules.

The overall participation of male and female members is low in the association meetings. When the meetings are crucial, and it is imperative that a household member attend the meetings, it is usually a male member who attends. Only 9 percent of the women in the sample, mentioned they attend critical water user association meetings (table 7). There is no rule that prevents women from attending and participating in the association meetings. Either the husband or the wife or both are able to attend and represent their interests at the meetings. However, attending meetings and discussing matters are thought of as male activities. The cultural barriers women have when they are together with men inhibit their participation. One of the women mentioned her reasons for not participating:

> *Meetings are on Friday nights. At that time, after cooking for my husband and the kids, I still have a lot of work around the house.... There is no reason for both of us to attend the meetings. Even if I go to the meetings it's only to hear what the men have to say. Men are the ones who talk and discuss. They know what to say and how to say it.*

Common reasons for the low participation of women in the association meetings among the whole sample are:

- The women do not have the time.
- Husbands do not like their wives going out in the night.

[12]The junta general is the main board of the water user associations. Since there are several communities benefiting from the same canal, there are several boards representing the different user groups, but the presidents of each of those form the general or the main water user association board.

- Women lack experience (for example, in managing meetings, talking in front of people).

- There is no need for both husband and wife to attend the meeting.

Here it is important to highlight that although women's participation in water user association meetings is low (60% do not participate), of the group of female-headed households, 67 percent of the women do participate in crucial meetings. In contrast, 93 percent of the women from household type 2 with older children never attend these meetings. In these households, if the husband cannot attend the meetings the elder son will participate.

According to some people (both men and women), women can perform better than men in a board position when they have higher education. In 5 of the 11 sub-juntas in the Garrapatal canal, women occupied positions of leadership, two as presidents of the sub-juntas, and three as secretaries. In the case of El Tambo, the new treasurer was a woman. In all of these cases, the women had more education than the average farmer; all of them had finished high school and three were schoolteachers.

TABLE 7.
Participation of women in the critical water user association meetings.

Partipation in WUA meetings	Household types				Whole sample
	Type 1	Type 2	Type 3	Type 4	
	%	%	%	%	%
Does not participate	47	93	69	0	60
Only when husband or a male family member can't go	53	7	23	33	32
Always participate	0	0	8	67	9

Conclusions

The report suggests that taking a closer look at women's urban /rural background and the issues they confront in the different types of household gives a better understanding of how gender roles and responsibilities are shaped within the household. It also helps explain variations in the gender-based division of labor, and how it affects the participation of women in agricultural activities, decision making, and in the water user organizations. It was found that women's participation in agriculture is higher in female-headed households, which represent approximately 10 percent of the households in the area of study. Although women's lack of participation in agriculture is similar among the other types of household (22% in type 1, 27% in type 2, and 23% in type 3), reasons for not participating varied widely. In households where the couple still had small children, women's participation in agriculture was limited by conflicting family obligations. In households with old couples, women were either too old or too sick to participate as they used to do in agricultural activities. Finally, in mature households where the couple had no small children, women preferred to engage in other activities by which they could control their own income.

In terms of heterogeneity of water uses and users, the study shows how the control over, and

access to, the water resource is influenced by factors such as land tenure, location, gender, and labor relations. Although women's participation in water user associations is low, and culture plays a strong role in terms of their decision-making power, women who had higher-than-average education occupied positions of leadership in the organizations. Also, women tried to solve their irrigation-related problems through informal ways where they had more decision-making power. Therefore, the importance of analyzing gender in agricultural production through different life stages to get a broader understanding of factors influencing irrigation is recognized.

This study focused on the mestizo communities of the middle and the lower zones of the Rio El Angel area, where ethnicity is not an important variable for differentiation. To have a better understanding of the users in the whole area, further research should consider ethnicity as a variable for differentiation (see Vallejo1997), as the communities in the upper zone have indigenous Andean influence, while in the lower zone, Negro communities have predominance.

ANNEX

Geographic location of the area of study in Carchi, Ecuador.

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