RESEARCH REPORT

59

A Gender Performance Indicator for Irrigation:

Concepts Tools and Applications

Barbara van Koppen

International Water Management Institute

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Research Report 59

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Barbara van Koppen

International Water Management Institute
P O Box 2075, Colombo, Sri Lanka

IWMI receives its principal funding from 58 governments, private foundations, and international and regional organizations known as the Consultative Group on International Agricultural Research (CGIAR). Support is also given by the Governments of Ghana, Pakistan, South Africa, Sri Lanka, and Thailand.

This research was made possible through generous support from the Ford Foundation, New Delhi, SIDA (Swedish International Development Agency) and the Dutch Government.

The author: Barbara van Koppen is a senior researcher at the IWMI (International Water Management Institute) regional office in South Africa.

The author gratefully acknowledges the opportunity offered by Doug Merrey, David Seckler, Constantina Safiliou, Ujjwal Pradhan and the anonymous reviewer to design, implement and refine the Gender Performance Indicator for Irrigation presented in this report. All colleagues in the various empirical studies, especially Jacobijn van Etten, are heartily thanked for their excellent inputs and commitment.

van Koppen, B. 2002. *A gender performance indicator for irrigation: Concepts, tools, and applications*. Research Report 59. Colombo, Sri Lanka: International Water Management Institute.

/ gender/ women / irrigation management / water management / policy / decision making / performance evaluation / indicators / irrigated farming / farming systems/ case studies / water users associations/ leadership / Burkina Faso / South Africa / India / Nepal / Sri Lanka /

ISBN: 92-9090-468-2

ISSN 1026-0862

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Summary

Although gender is a priority on the agendas of irrigation policy makers, interventionists, irrigation leaders and researchers, the gap between positive intentions and concrete action is still considerable. An important but hitherto ignored cause for this gap lies in the lack of adequate conceptualization and methodological tools that provide the insights that policy makers and change agents need.

The challenges to improve the current body of knowledge on gender and irrigation are fourfold. First, in order to accommodate the huge variation in the gendered organization of farming across the globe, policy makers and change agents need generic analytical tools that capture relevant and site-specific issues in any irrigation context, including the role of irrigation agencies themselves. Second, concepts need to be accurate and valid. Water obtains its value only as input in an encompassing farm enterprise. The significance of water for women farm decision-makers, who mobilize inputs themselves, differs fundamentally from its importance for women who are family laborers in farm households managed by their male kin. This needs to be taken into account in conceptualizing water in the gendered organization of farming, preferably quantitatively. Third, analytical tools for gender analysis should be easy to apply in an intervention context. Last but not least, the meaning and merits of "gender-inclusiveness" need to be clear, widely endorsed and well corroborated by evidence in order to serve as a generic yardstick for measuring "good gender performance."

The consensus that women farm decision-makers perform as well as men farm decision-makers, provided women have equal access to resources, is widely accepted. In this context, irrigation institutions that provide water resources equally to women farm decision-makers as to men farm decision-makers have a "good gender performance." Such performance boosts the productivity of schemes and increases incomes for both genders.

These four challenges incited the Poverty, Gender and Water Project of the International Water Management Institute (IWMI) to develop a Gender Performance Indicator for Irrigation (GPII). The Indicator was tested in nine case studies in Burkina Faso, South Africa, India, Nepal and Sri Lanka. This generic analytical tool answers the question whether irrigation institutions in a particular irrigation scheme are gender-inclusive and, if not, what irrigation agencies themselves can do to affect change. The tool also identifies gender issues that are rooted in a society's agrarian structure—beyond a strict mandate of irrigation water provision alone. The tool is meant for policy and intervention purposes at all levels and for academic use worldwide.

This report presents the underlying concepts of the GPII and methodological guidelines for its application. In addition, salient findings of selected applications of the GPII in Asia and Africa are presented to highlight how the tool captures policy-relevant variation.

The GPII seeks to answer two questions for empirical analysis in any particular scheme. The first question is whether the farm decision-makers in a scheme are predominantly male (a male farming system), female (a female farming system) or mixed (a dual farming system). The second question addresses inclusion and exclusion processes of women farm decision-makers, who are the majority in a female farming system and the minority in a male farming system.

Irrigation institutions are defined as the collective arrangements at scheme level for water

control and use. Three inter-related levels of irrigation institutions are distinguished: farm, forum, and leadership levels. This distinction gives analytical clarity and specifies action—if needed. The main "performer" in shaping inclusion or exclusion at any of these levels is either the irrigation agency (a factor that irrigation agencies can change) or locally prevailing production and institutional arrangements (which cannot be changed by irrigation agencies alone).

Gender performance is assessed by identifying the absence or presence of gender-based differences. Good gender performance means that gender based differences are absent (+). If mild gender-based differences exist, it is categorized as moderate performance (+/–). If there is categorical gender-based exclusion, it is identified as low gender performance (–). This classification is done for:

- Equal farm-level access to water and related obligations (water rights are connected to obligations that individual farmers have to carry out to earn their rights), which is directly related to equal access to resources for both genders for higher productivity and higher incomes.

- Equal participation in forums or networks for collective water management arrangements—generally required for strengthening access to water at farm level.

- Equality at leadership-level in the sense that the gender composition of leaders should reflect the gender composition of the farmers in the scheme. Also, women leaders should be able to function as well as men.

From selected applications of the GPII in female and dual farming systems and from other literature on the subject, it appears that irrigation agencies themselves tend to be the sole cause of exclusion and inclusion of women farm decision-makers. Where female or dual farming systems prevail, agencies exclude women from irrigation institutions by completely ignoring the local gendered organization of farming while vesting far-reaching powers and resource rights in the local (male) elite only. On the other hand, once agencies purposively include both male and female farm decision-makers in a bottom-up way into accountable irrigation institutions, they smoothly establish inclusiveness, higher productivity and the improvement of incomes for both genders.

The applications of the GPII in male farming systems yield different results. In the majority of farms, women are unpaid family farm workers. These local arrangements exclude the majority of women *a priori* from irrigation institutions. Local male dominance also leads to the exclusion of the minority of women who manage their own farms, especially at forum and leadership levels. Therefore within a strict mandate of water provision, the role of irrigation agencies is limited to supporting the minority of women farm decision-makers. For the majority of women, the issue is changing local production relations, where water is just one factor out of a range of factors. In such cases, agrarian societies and change agents, including irrigation agencies, need to promote women's farming opportunities in general.

Where female and dual farming systems prevail, efforts by agencies to include women systematically in irrigation institutions are definitely required in order to reach productivity goals. However, blanket measures to include all women in irrigation institutions are unrealistic, if not counterproductive, in male farming systems. For any effective irrigation intervention, it is imperative that the variation in gendered local production arrangements is understood. Applications of the GPII confirm that gender *always* needs to be taken into account and they also answer the question *how*.

A Gender Performance Indicator for Irrigation: Concepts Tools and Applications

Barbara van Koppen

Aim and Rationale of the Gender Performance Indicator for Irrigation

Conceptual Challenges

During the past four decades critical case studies and successful innovations led to a growing consensus among many irrigation policy makers, interventionists, local irrigation leaders, and researchers worldwide that gender is an important variable in irrigation (cf. Merrey and Baviskar 1998; Cosgrove and Rijsberman 2000). Increasing recognition within the irrigation sector was part of a broader movement of gender mainstreaming in agricultural and rural development, and indeed in global society, taken up by a wide array of people from grassroots women's organizations to international development and financing agencies (Grameen Bank 1998; SEWA 2000; World Bank 2000; UNDP 2000; IFPRI 2001). Today, gender is a priority issue on policy agendas. Yet, especially in the field of irrigation, there is still a considerable gap between positive policy intentions and the conversion of these intentions into concrete action.

An important but hitherto fully ignored reason for the slow conversion of gender policies into practice, at least in the irrigation sector, is the lack of generic concepts and analytical tools that can diagnose gender issues in any particular local irrigation context and indicate action that, under similar conditions, demonstrably led to higher agricultural output and improved wellbeing of women, men and their dependents. The accumulated body of knowledge from case studies and other experiences in the past,_–fruitful as they have been, failed to give insight that could effectively guide policy and intervention. These past lapses pose a fourfold challenge for the coming decades

Generic Concepts

Scattered case studies rarely give generic insights (Merrey 1997). Without a common conceptual framework that considers all relevant conditions, it becomes impossible to compare and distinguish generic features from site-specific ones. Thus, it remains unclear whether the widely documented negative impacts of women's exclusion from irrigation institutions, on both scheme productivity and women's and families, are equally negative under other conditions and if so under which other conditions (Hanger and Morris 1973; Dey 1980; Carney 1988; Illo et al. 1988; van Koppen 1990;

Prins 1996; Zwarteveen and Neupane 1996). Similarly, the proven claims of some innovative gender-sensitive projects in all continents that women were successfully included in irrigation does not answer the question of whether a similar positive impact can be expected if the same approach were adopted elsewhere (TIIPT 1993; Hulsebosch and Ombarra 1995; Carney 1994; Projet Sensibilisation 1995; Arroyo and Boelens 1997; Saini and van Koppen 2001). For policy and intervention purposes, it is important to know how agencies themselves shape gender inclusion and exclusion processes (a factor that agencies can change) and to what extent such inclusion or exclusion is a matter of locally rooted socioeconomic, cultural and institutional arrangements (which irrigation agencies alone cannot change). A generic framework for gender analysis in agriculture and irrigation would be especially important, because research regularly concludes that the variation in the gendered organization of farming is huge from local to global level. Policies and interventions have to be fine-tuned to highly varying local conditions in order to be effective.

Rather than undertaking more case studies, there is a need for generic concepts that focus on the relevant variables, capture local variation and highlight which specific role intervening agencies play. The application of these concepts in any given context would generate key information regarding gender inclusion and exclusion processes in irrigation and enable agencies to design more gender-sensitive intervention—if needed and if possible. Such conceptual framework would allow comparison between schemes and comparison over time within schemes, for example, to measure impacts of new intervention approaches.

Accurate Concepts

The second weakness in past research that inhibits the conversion of policy into action is theoretical. Concepts used in past intervention-oriented and theoretical research were inaccurate with regard to the specific character of water as a natural resource, and to the precise involvement of women and men in irrigated farming and water management. Water for productive uses in agriculture obtains its value only as input in an encompassing farm enterprise. Thus, access to water represents a direct gain for women farm decision-makers while it is not so for women farming under their male kin. In this sense water also differs from other natural resources, for example, land or forest. Access to land and forests represents a direct and important gain *per se.* Better inclusion of women in forums and committees on joint forestry management contributes directly to the wellbeing and empowerment of women. This explains positive responses from women to such innovative efforts (Sarin 1996). Similarly, legislation and law enforcement that strengthens women's access to land and empower them is widely documented (cf. Agarwal 1994; Deere and Léon 1998). Access to water plays a similar direct role as forest or land for women farm decision-makers. Women who manage their own farm enterprise need irrigation water and are the direct target group for irrigation agencies. However, for women who are just family laborers in an enterprise that their husbands manage, access to water does not represent a direct gain. Their male kin already negotiate for water and are, therefore, the primary target group of irrigation agencies. In this context, gender analysis in

irrigation can no longer just differentiate between women for variables like class, race, ethnicity and age, as it did in the past. Gender analysis also needs to differentiate between women with and without their own farm enterprise.

Whether women are farm decision-makers or just family laborers in a particular rural society is an underlying or prior gender issue. Society may, or may not, give men and women equal opportunities to become independent farm decision-makers with access to land, skills, inputs, capital, markets and water. If a society excludes most women from economic farm opportunities and if women, therefore, neither need nor demand water for their own empowerment, irrigation agencies cannot do much within their narrow mandate of providing water. Instead agrarian structures and overarching societal structures need to be changed. In such cases irrigation agencies should foster synergy with the wider movement of gender mainstreaming in rural development (Schreiner and van Koppen 2001). A conceptual distinction between patterns in agricultural roles that women play clarifies whether irrigation agencies deal directly with gender issues under their own mandates or not. Without this clarity they may follow a wrong track.

Past research also generally lacked quantification of essential information like the rough proportions of men and women farm decision-makers in a given scheme. Women farm decision-makers in need of water may be a small minority, while the majority of women are excluded from farming in their own names, or women farm decision-makers may constitute the large majority of farmers in a scheme. This not only determines the importance of the "prior" gender issue, as mentioned above, but this is also likely to entail considerable differences in gender-based inclusion and exclusion processes. A theoretically sound generic conceptual framework should be more quantitative.

User-friendly Methods

A third improvement in gender research that can guide policy makers and interventionists in designing action is ensuring that the application methods for the conceptual framework suit an intervention context. While concepts should be accurate and valid, the methods for implementation should first, maximally tap information that is already available (for example, among field staff) and second, allow some stretch in the degree of sophistication and depth of analysis. This means that even a quick, limited survey by project staff should be able to capture the main characteristics, while further in-depth analysis by social scientists from academic institutions could add considerable nuances and qualifications.

Good Gender Performance

The meaning and merits of the ultimate goal of gender mainstreaming, gender-sensitivity, gender-inclusiveness and gender equity in irrigation were often vague in the past. At the same time a virtually unanimous consensus has been reached among policy makers, practitioners, researchers and often also among women and men in local communities, about a clear notion of a goal. This is the recognition that women who are farm decision-makers *need* access to water as much as men farm decision-makers. Women farm decision-makers, like men farm decision-makers, are the people who are most motivated to bear the burdens of investments in water infrastructure and water payments and to become members of water users associations, because this enhances the productivity and incomes of the enterprises they manage. Hence, irrigation agencies need to reach women farm decision-makers, through irrigation institutions, on an equal basis as men farm decision-makers. Reaching farm decision-

makers of both genders serves the goals of productivity *and* improved income for women as well as men. There is ample evidence to show that women are as efficient producers as men, provided they obtain equitable access to productive resources and human capital and have a say over the output (for an in-depth discussion see Quisumbing 1996). The fact that productivity of women in irrigated agriculture is equal to that of men is confirmed in studies carried out in Burkina Faso (Zwarteveen 1997) and Senegal (Deuss 1994). Therefore, one can say that productivity of schemes increases if women farm decision-makers obtain access to water and are included in irrigation institutions on the same footing as men farm decision-makers.

This consensus involves a clear notion of gender-inclusiveness, or gender performance of irrigation institutions in a given scheme. Gender performance is good if it taps without distinction and discrimination both men's and women's productivity for improved incomes for both genders.

This widely endorsed notion of gender performance and the research challenges mentioned above incited the Poverty, Gender, and Water Project of the International Water Management Institute to develop a Gender Performance Indicator for Irrigation (GPII). The Ford Foundation, New Delhi and the Swedish and Dutch governments supported this research project. The Indicator was applied and tested in nine case studies in Burkina Faso, South Africa, India, Nepal and Sri Lanka. Most of these case studies are published separately as IWMI Working Papers (see appendix A).

The Gender Performance Indicator for Irrigation (GPII)

The GPII is a generic analytical tool for gender analysis in irrigation that diagnoses gender issues in a particular scheme and orients change agents in designing action for higher productivity and more gender equity, or "better gender performance." It addresses all the theoretical and policy-practical challenges mentioned above. The focus is on collectively managed irrigation schemes that are supported by external governmental or non-governmental agencies or irrigation leaders whose ultimate goal is to contribute to gender-inclusive rural development.

The performance of irrigation institutions in a particular scheme is considered "good," if women farm decision-makers have access to irrigation water and are also included in irrigation institutions on the same footing as men farm decision-makers. Irrigation institutions are defined as the collective arrangements in a scheme that govern water control and use through construction and maintenance of infrastructure, water abstraction, water allocation, distribution and resource mobilization. Three levels of irrigation institutions are distinguished: farm, forum and leadership levels. These irrigation institutions are shaped at the interface between local communities and intervening agencies. The GPII explicitly identifies who is performing through these institutions by weighing the influence of agencies compared to the influence of local socioeconomic, cultural, political and institutional arrangements.[1]

[1]The GPII focuses on water for cropping in collectively managed schemes. The tool does not consider the many other purposes for which irrigation water is typically used by both men and women. Further, the focus is only on water used for one's own farm and not on water sale. Water sale differs from the processes addressed by the GPII. In fact, especially in male farming systems, water sale offers opportunities even to women without a farm decision-making role in their family farms—as observed in a study in Bangladesh on women groups selling water (van Koppen and Mahmud 1996).

In any particular scheme the GPII seeks to answer two questions. The first question concerns the gender of the farm decision-makers. By analyzing the gendered nature of local farming in a scheme, the scheme is classified into a male, dual, or female farming system (Safiliou 1988). If only a minority of the farm decision-makers say less than one-third is female, the scheme is called a male farming system. If a majority say more than two-thirds is female, it is called a female farming system, while a farming system where the female to male proportion is roughly equivalent is considered mixed. These boundaries are, however, arbitrary.

The second question relates to inclusion and exclusion processes in irrigation institutions. A comparative analysis is made of inclusion or exclusion of men and women farm decision-makers (who are either a minority or majority depending upon the gendered organization of production) in irrigation institutions.[2] Gender-specific differences, if any, are identified for three aspects of irrigation institutions at different levels:

- Access to water at *farm* level, which encompasses both water rights and obligations, and also access to land in the irrigated command area, if this is on the agenda.

- Inclusion in *forums*, which are the formal and informal networks (such as water users associations) to which, in principle, all farmers in the command area belong, and in which rules for rights to water and land and obligations are set and reinforced from the lowest to the highest tiers.

- Inclusion in leadership positions in these forums, and the ability to function well in those positions.

For each of these aspects, the performance of irrigation institutions is good, according to the GPII, if there are no gender-related differences between male and female farm decision-makers in access to water at farm level, in participation in forums, in taking up of leadership positions and the ability to function well in them. If a section of the women farm decision-makers face mild gender-based obstacles, scheme performance is considered moderate for that aspect. If women farmers are categorically excluded because of their gender, the performance for that component is low. The specific role of the intervening agencies in shaping irrigation institutions, and thus in contributing to a good or weak gender performance, is also studied at the farm, forum and leadership levels. This report presents the concepts, methodological guidelines and salient findings of selected applications of the GPII. On the basis of these empirical case studies and other literature on the subject, generic and very diverse policy implications are derived. These differences underline the need to apply the GPII worldwide, routinely.

[2] In the GPII, the concepts of inclusion and exclusion are used at an empirical, localized level. For a discussion of the various interpretations of inclusion and exclusion, see Kabeer 2000.

Concepts and Methodologies

Gender Classification of Farming Systems

Concepts

The examination of intra-household organization of production in farming households in a given scheme answers the first question of the GPII, which is to identify who the farm decision-makers are. As widely acknowledged now, households in general and farm households in particular are typically *not* units in which resources are pooled with the male head as main decision-maker and representative. Instead, it fits reality better if intra-household relations are conceptualized as bargaining processes between household members regarding the allocation of resources and spending of incomes (Jones 1986; Haddad et al. 1997; World Bank 2001). Or, more precisely for the purpose of the GPII, there is an intra-household specialization along gender lines with regard to productive activities. The household can be considered as composed of one or two or more intra-household production units (Safiliou 1988). Individual adult household members have production units that are identifiable as their own and they have considerable autonomy with regard to labor allocation and income utilization. While all household members share the common goal of family welfare, each household member tries to maximize benefits for him or herself from the allocation of their labor and other agricultural investments through negotiations with other members—"trying to get the best deal of it." In all these negotiations, the limiting factor is family welfare and family stability. Household members may consider sacrificing family stability only in extreme situations where negotiations completely break down and the prevailing conditions are untenable (Safiliou 1988).[3]

Distinguishing intra-household production units not only adequately conceptualizes the gendered organization of irrigated agricultural production, but it also reflects the reality that irrigated agriculture is usually only one activity in a range of income-generating activities in farm households. Worldwide, both small and large farms are typically "pluri-active." They engage not only in rainfed and irrigated cropping but often also in livestock, off-farm employment, trade, food processing, fisheries, etc. An analysis of the intra-household organization of irrigated farming allows identifying the main decision-maker in one particular domain—farming the irrigated plot.

The analysis of the intra-household organization of production on a particular irrigated plot can be more or less in-depth. In a quick analysis the overall main manager would be identified. In a more elaborate analysis the range of farm decisions and activities, relevant to the local context, would be studied. Decisions may be:

- benefit-related (e.g., crop choice, use of the produce and of the money gained from sale),

[3] Theoretically, an intra-household production unit can be managed in a truly joint way, but evidence is rare. Probably, the rather egalitarian gendered division of tasks combined with bilateral land inheritance reported in the Andean regions in Latin America or parts of Madagascar (Raparson 1989) come closest.

- resource-related (e.g., access to land, credit, water),

- technology-related (e.g., technology use and irrigation) or

- labor-related (e.g., labor mobilization, calendar of operations).

Further insight is gained by identifying the household member who primarily carries out different agricultural activities. Activities vary in importance. Core tasks critically affect the success of the irrigated farm (Bock and De Rooij 2000). Core tasks are skilled and require investments, inputs, use of technologies and negotiations with the outside world. Carrying out core-tasks expresses a stronger farm decision-making role in the enterprise. Core activities include:

- benefit-related activities that tend to enhance one's say over the output, like marketing,

- resource-related activities, for example, obtaining access to land and credit and

- technology-related activities such as ploughing, applying fertilizer and irrigating at field level and negotiations over water in forums.

On the other hand, labor-related activities, merely requiring unskilled or semi-skilled efforts, tend to give little say over the enterprise and its output.

Global Variation

The gendered organization of farming needs to be assessed separately for each specific situation because gender patterns in farming vary significantly over the world and are subject to continuous change. A multitude of factors influence these patterns. Land tenure is certainly an important one. The spouse with the stronger land titles usually has a stronger voice in the farm enterprise. However, this is not always the case. Especially in sub-Saharan Africa, women may have life-long tenure security to land of their in-laws that they cultivate as their own intra-household production unit. On the other hand, in male farming systems, women may be landowners while gendered norms and a range of other obstacles may constitute such strong impediments for the self-management of farms that women landowners decide to lease out their land, often below market rates, as reported in South Asia (Agarwal 1994).

Other factors that influence gender patterns in farming include culture and ethnicity, class and wealth or gender-biased agricultural technological development. Reportedly, specific agro-ecological zones like the wetlands in sub-Saharan Africa also have higher proportions of plots managed by women than adjacent dry lands (Dey 1980; Richards 1986). Worldwide, homestead cultivation is often a female farming system, although homestead land may belong to men who also perform specific activities like ploughing, as in Jambar, a village in South Gujarat, India (van Koppen et al. 2001a).

Locally prevailing gender patterns in farming also vary according to household composition, stage in the household cycle and age (Bastidas 1999), head of the household, personal

preferences, etc. Gender-segmented off-farm employment opportunities and high male ratios in out-migration lead to the feminization of agriculture and the change of male farming systems into dual and female farming systems. In southern and eastern Africa, female and dual farming systems are endemic. In some regions 50 or even up to 90 percent of the farms are female-managed (FAO 1998; Makhura and Ngqaleni 1996; Safiliou 1994). Dual systems may also occur, pocket-wise, in traditional male farming areas, as reported in Nepal (Zwarteveen and Neupane 1996).

Methodological Guidelines

In order to assess the intra-household organization of irrigated production a survey among all irrigating households, or a representative sample, should be conducted. Interviews should be held with the farm decision-makers themselves (female or male). Observations can complement the survey findings. Local project staff, extension workers or farm leaders who know the scheme well often have considerable insight into the gender of the decision-maker of each plot. Such local knowledge is usually information many projects already have or can easily access, but fails to trickle-up to policy levels. At the same time, social scientists can considerably deepen their understanding, refine typologies of gendered farming, highlight the precise role of input water, extend the study to the role of wage labor, etc. In any case existing lists of farmers are notoriously misleading, because these tools are for administrative or demographic purposes, and tend to register either the household head or the landowner. Administrative simplification tends to ignore production relations and to falsely equal farm decision-making to headship of a household or landownership.

The initial answer to questions about the intra-household organization of production is likely to be that the plot is jointly managed. Interestingly in the applications of the GPII, this was found to be the case in both male and female farming systems. This answer is easy and nowadays socially acceptable even in male farming systems. Some further probing is usually sufficient to give unambiguous answers as to whether the farm manager or the household member taking specific decisions or carrying out certain activities is a man or a woman or whether the family members farm jointly.

For any specific irrigation scheme where the farm decision-makers are identified, the gender classification follows from the count of the proportions of male and female farm decision-makers. As mentioned before, a scheme with a two third majority of male farm decision-makers is classified as a male farming system, a majority of women signifies a female farming system, while a dual farming system is in-between. A gender classification of the scheme constitutes the first component of the GPII.

The Roles of Irrigation Institutions and Agencies

Irrigation Institutions

The second component of the GPII assesses gender-based inclusion or exclusion of women farm decision-makers in irrigation institutions at farm, forum and leadership levels. It also assesses the main performer by comparing whether gender-based inclusion and exclusion is primarily due to agencies or whether inclusion and exclusion is rooted in local socioeconomic, cultural and political relations—especially production relations and locally established irrigation institutions. As mentioned before, in schemes with female and dual farming systems such inclusion or exclusion processes concern the substantive proportion of women farm decision-makers. In male farming systems, the analysis of gender-based inclusion and exclusion focuses on the minority of women farm decision-makers.

Irrigation institutions in a certain scheme are defined as the collective arrangements through which irrigation infrastructure is constructed, rehabilitated, maintained, water is derived from streams or groundwater and allocated and distributed and resources for these purposes are mobilized. Irrigation institutions and access to water and water rights at farm, forum and leadership level can be seen as closely interrelated when water rights are holistically defined as the full scope of rights and obligations that cover socio-political control and uses of water (F. von Benda-Beckmann and K. von Benda-Beckmann 2000).

Irrigation institutions are a historically developed blend of local socio-political, cultural and economic relations and interventions by external irrigation agencies and other agencies. Key decisions, including those affecting gender dimensions, are often taken in the planning phase of new investments in infrastructure. This includes site selection and thus the selection of the beneficiaries of the newly irrigated land. In the case of localized land redistribution, new allocations to either men or women are also mainly decided upon in the planning and design phase. Later events, such as a scheme extension or the transfer of irrigation management obligations and rights from the agency to newly established water users associations are commonly just variations of the earlier theme—although they may open up new opportunities. Therefore, exclusion at the start is difficult to redress at a later stage. Also, in the planning phase, there may be options for gender-inclusive intervention that disappear soon thereafter. This implies that the GPII can inform interventionists critically and timely, if applied in the design phase as an ex-ante gender impact assessment tool for various planning scenarios. Also, ex-post reconstruction of these historical decisions largely explains the gender performance of irrigation institutions at later stages.

The assessment of gender-based inclusion or exclusion of women farm decision-makers should be fine-tuned to the agenda of the scheme at the analyzed moment. For example, land reallocation may be an issue or not. An example in which irrigated land reallocation is the key issue is given later. In a number of other case studies and literature the issue on the agenda is the transfer of irrigation management to newly established water users associations. These latter applications examine the gender-inclusiveness of the new organizations. In these schemes, land tenure is only relevant in the sense that categorical membership criteria may formally be vested in landowners. Indeed in most irrigation schemes today, categorical rights of access to water, inclusion in forums and eligibility for leadership are all vested in members.

In any analysis of the roles of agencies in localities, legal pluralism needs to be recognized (von Benda-Beckmann 1991). Agencies often adhere to one set of norms and rules governing the control and use of water derived from formal law or its interpretation, while community members may adhere to a different set of norms or “local law.” Further, in any form of law, categorical rights need to be distinguished from concretized rights. Categorical rights define in general terms the legal status of categories of persons and property-objects, as well as the type of rights and obligations between persons with respect to property-objects. Concretized rights are realized abstract rights. Thus, in this context, they refer to water actually received and effective membership or de facto eligibility as leader. Concretized rights are the result of successful negotiations to implement what is normatively seen as legitimate. This distinction is important. As F. von Benda-Beckmann and K. von Benda-Beckmann 2000 argue: “the crucial issue is the embodiment of a categorical right in a social relationship between actual persons with regard to actual property-objects. Much of

the gender inequality is precisely the result of women's inability to engage in social interactions for enforcement of the transformation of categorical rights into concretized rights."

Table 1 summarizes gender performance issues that are commonly on the agenda of irrigation schemes.

Performance for any aspect is good (+) if there are virtually no gender-based differences. If mild differences that have negative effects on women farm decision-makers are found, performance is moderate (+/–). If most women farm decision-makers face major problems compared to men who farm under similar conditions, performance is low (–). More specifically, performance at leadership level is good if the gender composition of farm decision-makers in the scheme is reflected in the gender composition of committees—for the highest positions as well. Moreover, women leaders should also be able to function as effectively as men. If this is the case, gender-based obstacles in the election processes and obstacles against the functioning of women leaders can be assumed to be absent. The main performer compares the actors' influence on irrigation institutions. This is important to discern the agency's own need or scope for action. Underlying concepts, concrete research questions and methods for measurement of each aspect are described below.

Farm-level Inclusion and Exclusion

At farm level, gender performance is assessed through the question:

> Are there gender-based differences in male and female farm decision-makers' categorical and concretized rights to water, irrigated land and concurrent obligations?

Farm-level access to water and obligations is partly a matter of categorical water rights—especially the criteria according to which someone is entitled to water, and another is person not. In water users associations, membership rights typically stipulate who has rights to water and other services and against which obligations and who does not have these rights. More important are concretized water rights or water actually received. This is directly linked to productivity and incomes, which is at the heart of good gender performance. If women farm decision-makers obtain access to water on the same footing as their male colleagues, women's production will be as good as men's, which in turn will foster both the productivity of the scheme and women's incomes.

TABLE 1.
Gender performance issues commonly on the agendas of irrigation institutions.

If applicable: categorical and concretized land righats	Categorical membership rights if relevant, according to land ownership	Concretized water rights at farm level	Concretized inclusion in forums	Concretized inclusion as leaders	Ability to function as leaders
performance	performance	performance	performance	performance	performance
Main performer: agency or local production and institutional arrangements					

Access to water can be assessed in various ways. A sophisticated way of doing this is by comparing the quantities of water received by male and female farm decision-makers cultivating the same crop on similar soils. An alternative would be to compare the number of waterings. Qualitative differences between men and women such as satisfaction about water service received or irrigation strategies adopted are also informative. Taboos for women also entail gender-biases like the norm that women should not irrigate at night.

Water rights are connected to obligations that individual farmers have to carry out to 'earn' their rights. Depending upon the local context, they include payment or labor contributions to canal construction or maintenance. Gender-based differences in *obligations* can also be measured more or less in-depth and in various quantitative and qualitative ways.

The role of agencies in shaping farm-level rights and obligations are manifest in their definition or co-definition of membership criteria for water users associations or categorical rights to water, for example, by connecting or not connecting water rights and primary land titles. The role agencies play in enabling male or female water users to concretize or not concretize their water rights may be more indirect, but it can also be direct at times, for example, when local staff of public irrigation agencies distribute water up to field level, or when they mediate in conflicts between neighboring farmers.

Inclusion and Exclusion in Forums

At forum level, the GPII assesses good, moderate or low performance by answering the question:

> Are there gender-based differences in the participation of women and men farm decision-makers in forums?

Forums are the formal and informal networks in a particular scheme through which collective arrangements, such as rules and regulations for infrastructure construction, maintenance and rehabilitation, water allocation, distribution, enforcement and obligations are endorsed, debated, set and often reinforced. Identifying inclusion and exclusion in forums is an essential part of the GPII, because inclusion in forums generally strengthens one's access to water at farm level—especially in the long run. However, there are exceptions of individual women who may prefer free-riding, such as high class women in male farming systems in upstream areas where their access to water is guaranteed (Zwarteveen and Neupane 1996). Besides fostering productivity and farmers incomes, inclusion in important local social networks also has its own merits—it gives prestige, opportunities for negotiations in other domains, exposure to new ideas, new practices, etc.

The precise nature of forums in any local context has to be identified for the concrete empirical comparison of inclusion of men and women. Forums can be relatively simple, of low intensity and transparent. This is the case for most management regimes of irrigation water and other common property resources analyzed by Ostrom 1994. Some members serve in committees, usually without remuneration. Only collectively appointed water distributors may receive some compensation. Forums can also be more complex, as analyzed by Shah 1996. Larger irrigation schemes, sometimes with up to hundreds of thousands of farmers, are typically organized in tiered structures with some form of representation of the lowest tiers at higher levels. Irrigation institutions with multiple purposes, such as input provision and marketing, are also more complex. In such member organizations forums are the link between all members and articulated governance and operational structures of the organization. Usually these networks are open for all irrigators in the scheme. The degree of formalization may also differ widely. Interactions

among neighboring farmers of the same watercourse, or spontaneous gatherings in public places like teashops or markets are informal. Meetings, such as annual assemblies, are formalized. Categorical farm-level water rights and obligations often coincide with formal categorical rights of membership of water users associations.

In exploring the degree of inclusion or exclusion, participation needs to be specified. Participation may vary from just being aware of earlier decisions taken by others to being explicitly invited, factually attending meetings, voicing interests, participating in farm decision-making, voting and even setting the agenda.[4] Obstacles that are to be identified may lie within households, for example, if husbands refuse women attendance. Obstacles may also be outside the household as in cases where women lack physical and social mobility and face strong social norms and taboos about their behavior, for example, meetings with strange men, etc. Again, the analysis of gender-specific inclusion and exclusion processes and women's coping strategies can range from impressionistic to sophisticated.

Agencies play a very important but often ignored role in constituting these forums. Agencies often influence formal membership criteria and they co-decide about the design of new water users associations. Elements of such designs are the structuring of forums, for example, the accountability of leaders towards their constituency. Agencies exert even more influence by factually contacting, inviting and soliciting the active collaboration of some local people, but not others. Agencies also set agendas. Critical issues may only be discussed among a small select group or never discussed at all in forums.

Inclusion and Exclusion as Leaders

Gender performance at leadership level is assessed by answering the question:

> Are there gender-based differences in the eligibility and factual occupation of leadership positions by women and men farm decision-makers, and in their ability to function as leaders?

Leadership is manifest in categorical and concretized eligibility to serve in specialized governance and operational structures, such as membership of committees, and the prestige of the functions occupied. In a true member organization, one would expect the gender composition of the constituency to be more or less reflected in the gender composition of the elected leaders. A strong bias indicates the occurrence of other processes, of which the most common is domination by male local and political elite. Different groups and agencies may attach different values to such gender-based exclusion. For individual male and female members the most important factor is probably the ability of leaders, whether men or women, to function effectively and the power of members to hold leaders accountable. Therefore, it is even more important to assess the ability of men and women to be effective leaders and the reasons affecting this ability as part of the GPII. This additional aspect also allows distinguishing effective inclusion of women from tokenism. Imposed nomination procedures may seem to enhance women's inclusion in committees. However, in reality these 'elected' women can still be quite ignorant of key

[4]See van der Molen 2001 for an extensive overview of various aspects of participation and categories of participants in farmer organizations in endogenous tank irrigation in Sri Lanka.

information and can be excluded from decision-making in the committee. On the other hand, illiteracy and lack of training in leadership and in organizational and accountancy skills often constitute real barriers for women to become leaders and to function effectively. While, admittedly, the issue of leadership is complex, it is in any case important to make an analytical distinction from forum and farm level issues. This allows for more precision about implications for action and avoids a narrow focus on leadership issues alone, as one may observe in current policy debates.

Most external irrigation agencies play a major role in creating leadership, either directly by vesting far-reaching authority in some people and excluding others, or by designing and implementing a new organization and thus formally and *de facto* shaping accountability relations between members and the leaders.

Methodological Remarks

Evidently, for detailed field study of gender-based inclusion and exclusion in irrigation institutions at farm, forum and leadership levels, agendas of agencies and the local context and general arrangements need to be well known—before meaningful questions can be asked. For some issues, such as participation, indicators can be developed. Generally situations of water scarcity, such as periods of peak water demand or the tail ends of canals are especially informative to study water rights in general and gender differentials in particular. A reference period previous to the study and a list of main events, such as meetings or days for maintenance of a certain part of the scheme further help to structure questions.

Most questions can be addressed through surveys and therefore can be included in the above-mentioned surveys for the intra-household analysis of farming systems. Other methods too can add important information. Participatory observation of informal negotiations over water and of formal meetings, focus group discussions with certain categories of men and women, detailed dispute analysis and case studies on individual or collective coping strategies adopted by women are some of the methods that can be used. Perceptions of men also need to be studied. For the analysis of inclusion and exclusion concerning leadership posts and the ability to function in them, leaders need to be interviewed specifically but other people's opinions on leadership issues are also relevant. Interviews with the staffs of agencies at various levels and the review of project documents are indispensable to analyze policies and practices of agencies.

Applications of the GPII in Female and Dual Farming Systems

Agency-induced Exclusion and Resilience in a Female Farming System

The first application of the GPII was in a wetland improvement project in southwest Burkina Faso (van Koppen 1998). This case not only shows the negative effects of male bias in agencies, but also the resilience of a female farming system. These locally prevailing production relations were the single most important factor that forced the project to change in later schemes from a male-biased intervention approach towards a more gender-inclusive approach. The later gender-inclusive approach the project adopted, as its standard procedure, also appears to be effective wherever female and dual farming systems exist. It was observed to have the capacity to enhance productivity and women's incomes. The GPII

applied to the situation before the project, during the first schemes, and during the later schemes captures the essence of the inclusion and exclusion of women farm decision-makers.

Gender Classification of Farming System and Gender Performance of Local Schemes

In the low-lying wetlands of the west Comoé province in Burkina Faso, a rice cultivation area, 80 to 90 percent of the plots are cultivated by young and especially older women—as their own production units. Men as a gender are the farm decision-makers on the upper dry lands for which they solicit labor inputs from their wives. Inheritance of wetland plots from mother to daughter is common, while husbands and mothers-in-law also mediate in providing rice plots to women. These wetlands are governed by the low intensity common property regimes mentioned above (Ostrom 1994). Within the clan of the "land chiefs," the local land custodians, the women of the clan assume most functions in the wetlands. In some cases, it is even taboo for male land chiefs to enter wetlands during the rainy season, because this is believed to cause inundation. To outsiders, however, brothers, fathers or husbands of the female land chief tend to be the representatives. Male land chiefs also perform religious functions. The GPII for the pre-project situation is given in table 2.

Exclusion Caused by the Agency in the First Two Schemes

In 1980, a Rice Cultivation Improvement Project began in these wetlands. This project was initiated and implemented by the regional ministry of agriculture and funded by the European Community. The project intended to intervene in eight rice valleys in the project zone till 1987 in order to construct central drains, sluices and bunds according to contour lines for better water management. Before construction, land was expropriated. It was then divided in to equal-sized plots and reallocated after construction.

The first two schemes were constructed simultaneously. In these two the technical project management, who concentrated fully on rapid construction, only interacted with a handful of (male) village authority figures. This elite arranged the expropriation of land, promising the women that they would get it back. Yet, after construction when the improved plots were to be reallocated, this village committee of project management and the village elite decided to allocate the improved rice plots to men only. As male heads of households, beneficiary men were supposed to arrange the intra-household and "cultural" affair of farming and land allocation. All project staff were misled by the concept of a unitary household, represented by the male heads. Even the social scientists in the project, who relied mainly on

TABLE 2.
The GPII in wetlands in southwest Burkina Faso before the wetlands improved project.

Categorical and concretized land rights	Categorical membership rights	Concretized water rights at farm level	Concretized inclusion in forums	Concretized inclusion as leaders	Ability to function as leaders
+	+	+	+	+/–	+/–
Main performer: local arrangements					

demographic survey data and lists from the tax offices, imagined that rice cultivation would become a family farm affair after the project—even they had failed to discover the existence of production units and land rights specific to women.

When these first schemes started functioning, the male land titleholders expected women to continue providing all the labor while the new land rights of men entitled them to appropriate most of the harvest. The women felt "betrayed by their men." They had lost their plots plus their say over the rice harvest. This discouraged them from producing. Moreover, membership of the new water users association, which entailed obligations for maintenance, was vested in land titleholders as well. Women were excluded from the forums where collective rules were set and implemented. However, in most parts of the two schemes, men failed to fulfill their labor obligations because their primary interests continued to be in the uplands. Lack of maintenance of the infrastructure further contributed to decreased production and even abandonment of large parts of the scheme.

Remarkably, even the regional director of the ministry of agriculture, who was one of the very few who had understood the previous local farming system and recognized the negative consequences of this project for women and their dependents, failed to see a solution. His personal interpretation of the law was that "after public intervention, the administrative allocation ignores women whose juridical existence is only through the family head." Thus, even he contributed to the introduction of new forms of exclusion, based on a personal interpretation of marital law, which was totally alien to local land and water tenure. The low gender performance of the first two schemes is summarized in table 3.

Resilience of Local Production Relations and the Subsequent Inclusion of Women

The change in the procedures of land expropriation and reallocation in the third and fourth schemes was the result of local initiatives by women, their husbands, female and male land chiefs and receptive field staff. The crucial difference with the first two schemes was, simply, the time span of some years between the first contact with the project and the start of construction. During this period, full consensus was reached in the community that the existing plot holders, whose names were known by the land chiefs, obtained priority rights for new allocations.

This procedure evolved into a standard gender-sensitive procedure for all later schemes in the project zone (and documented as a generic approach elsewhere in the world too). In this approach, open meetings are organized first, for which the current farm decision-makers and anyone else interested are invited. The participants at the meetings are then informed about the project—the technical aspects, the land

TABLE 3.
The GPII in wetlands in southwest Burkina Faso in the first two schemes of the wetlands improved project.

Categorical and concretized land rights	Categorical membership rights	Concretized water rights at farm level	Concretized inclusion in forums	Concretized inclusion as leaders	Ability to function as leaders
–	–	+	–	–	–
Main performer: agency					

redistribution and proposed organizational design. Current plot holders and other candidates are registered as future land and water titleholders before any construction begins. After construction and land reallocation, they become members of the new water users associations, fulfill their maintenance obligations and elect their leaders. However, in the committees, the minority of male rice cultivators remains over-represented. By extensive literacy improvement and other training programs, the project is building the critical mass for a pool of women candidates for future leadership.

In all later schemes, men were explicitly invited to apply for new rice plots. Nevertheless, the majority of new applicants were invariably women, except for one site where land pressure on upper dry lands had become high. This caused some men to apply for rice plots as well. Table 4 captures the good gender performance of the later schemes.

This case study is an in situ experiment, so the respective roles of the project or local arrangements as the main cause of events, or performer in the GPII, can be easily identified. The local socio-economic conditions in the subsequent schemes are rather similar. Only the procedures for land expropriation and reallocation differed. In the first two schemes the agency was very dominant, while in later schemes communities obtained a stronger say. Thus, the agency was the *only* cause of women's marginalization. Locally, such exclusion had never existed before. This marginalization was the result of the agency's complete ignorance of the gendered organization of farming, combined with an authoritarian approach in which, under high time pressure, far-reaching decision-making powers were vested in a handful of local elite. In later schemes the locally prevailing organization of farming smoothly re-emerged as the most obvious basis for the new farming system and irrigation institutions. It only required some time to crystallize. None of the later schemes had the productivity and maintenance problems of the first schemes. The inclusive approach that the agency later adopted is straightforward—recognizing and organizing farm decision-makers, whether male or female, in a bottom-up way *before* construction and strengthening the resource rights of the farm decision-makers while demanding them to fulfill obligations.

Gender Performance of Irrigation Institutions in Other Female and Dual Farming Systems

The case of the wetland improvement project in Burkina Faso highlights, in a nutshell, the core arguments raised in many other case studies: blindness of agencies in recognizing prevailing female or dual farming systems and the ways in which agencies vest far-reaching decision-making powers in a male elite and thereby exclude women farmers from membership of forums and leadership positions. Reportedly, the loss of rights to water and irrigated land, which women farmers possessed earlier, and declining productivity are similar results that these studies

TABLE 4.
The GPII in wetlands in southwest Burkina Faso in the later schemes of the wetlands improvement project.

Categorical and concretized land rights	Categorical membership rights	Concretized water rights at farm level	Concretized inclusion in forums	Concretized inclusion as leaders	Ability to function as leaders
+	+	+	+	+	+/–
Main performer: initiated by local arrangements, acepted by agency					

have yielded (Hanger and Morris 1973; Dey 1980; Carney 1988; Illo et al. 1988).

The other side of the coin is also found elsewhere. In female and dual farming systems, quite a few agencies learned from their mistakes and started actively adopting the above-mentioned inclusive approach from the design stage itself. This did have expected effects (Carney 1994; TIIPT 1993; Hulsebosch and Ombarra 1995; Arroyo and Boelens 1997; De Lange et al. 1999).[5] While most case studies are from Africa and Latin America, there is also evidence from India. The Aga Khan Rural Support Programme, India (AKRSP-I) also recognized that homestead cultivation is a female farming system with women being the main cultivators, although men typically own the land and are responsible for ploughing. In the village of Jambar, south Gujarat, AKRSP-I successfully organized women in a bottom-up way to own and manage a collective pump to irrigate their homesteads (van Koppen et al. 2001a). In virtually all these case studies the gender performance at farm and forum levels is good, although men still tend to be over-represented in leadership positions.

Because water rights and membership of water users associations tend to be vested in those with primary land titles, a closer look is necessary to find whether this suits women farm decision-makers. In some contexts, such as in the wetlands in southwest Burkina Faso, women are farm decision-makers, the household members with the primary land titles and the members of water users associations. However, in other cases such as in Jambar, men typically own homestead land. There can also be a mix, as shown in a case study in the Tongwane sub-catchment of the Olifants river in a former homeland of South Africa. Out of 176 irrigated plots in various irrigation schemes in this sub-catchment, 62 percent are cultivated by women, 24 percent by men and 14 percent jointly by both spouses. However, among the women farm decision-makers, 36 percent *do not* have titles for the land they cultivate. Ten percent of the men farm decision-makers also cultivate land of others (van Koppen et al. 2000b). In cases like Jambar or the Tongwane sub-catchment, where women are farm decision-makers but men have stronger land rights, vesting membership of water users associations in the factual farm decision-maker (who is also most motivated to increase the farm's productivity through water) rather than the person with the primary rights to the land, generally benefits women and stimulates production. Some agencies adapted to this reality. For example, the concern to open up membership of new water users associations to women farm decision-makers, irrespective of the type of land rights they have, was one of the reasons for the government of the Republic of South Africa to disconnect landownership and membership of water users associations in the National Water Act of 1998 (Republic of South Africa 1998).

Generic Policy Implications

Where female and dual farming systems prevail in Africa, Asia or Latin America, there is scope for irrigation agencies to enhance women's incomes by supplying them with water in their own names, or by vesting rights of irrigated land to them. This is also absolutely necessary in order to achieve the productivity goals of irrigation investments. Agencies themselves are the main performers in

[5]In the West Kano irrigation project, Kenya, the agency only accepted to hold meetings if women constituted at least half of the participants. Otherwise they cancelled the meeting. Moreover, in the first few years, the agency organized women in women-only groups, in which they were well informed and encouraged to articulate their interests in preparation for the subsequent mixed meetings (Hulsebosch and Ombarra 1995).

either excluding women farm decision-makers or, more recently, successfully including women and men on an equal footing in irrigation institutions. Agencies, whether formalized state agencies, NGOs, or local leaders, should analyze and build upon the gendered organization of local farming and recognize both male and female farm decision-makers as competent producers. As women are the managers of farms in which water is an input, women's inclusion in irrigation institutions along with men is a straightforward matter of bottom-up organization of all farm decision-makers—irrespective of type of land rights—into member-based water users associations that can demand accountability from their leaders (Shah 1996). If this is practiced, gender-based exclusion at farm level or forum level is unlikely to occur. However, for inclusive leadership support, there is still a need to develop women's organizational and leadership skills. In female and dual farming systems, the key policy issue is that policy makers and interventionists themselves should ultimately learn.

Application of the GPII in Male Farming Systems

This section presents significant findings from selected applications of the GPII in male farming systems. They present an overall picture that gives a basis to formulate generic policy recommendations.

Prior Exclusion of Women from Farm Decision-making in Large-scale Irrigation Schemes in Andhra Pradesh and Gujarat, India

Here the focus is on the first question of the GPII, which seeks to identify the gender of the farm decision-makers. This is elaborated, quantitatively and in-depth, in a case study of large-scale canal irrigation schemes in Andhra Pradesh and Gujarat, India. Men manage most farms in these schemes. In these schemes, the government recently handed management over to newly established water users associations (van Koppen et al. 2000a). A policy issue that concerns these farms is the desirability and feasibility of the introduction of joint water rights between spouses and joint membership in the newly established water users associations. Cooperative law in Gujarat offers that option (Government of Gujarat 1996). This is examined below. The analysis further highlights the characteristics of the minority of women that still takes up farming in their own names and the influence of variables like headship of households, landownership and farm size.

Household-level Exclusion of the Majority of Women

The first case study was carried out in seven irrigation schemes recently transferred to water users associations in Andhra Pradesh and Gujarat. The seven schemes were chosen randomly from the main agro-ecological zones in Andhra Pradesh (Telangana, Rayalseema and the coastal area) and Gujarat (the dry northern region and the semi-arid central-south region). A stratified sample of 700 households was selected, consisting of small farms with operational holdings of less than one hectare and larger farms with holdings of more than one hectare. *De jure* female-headed households were purposively included.

The intra-household organization of production in male farming systems in Andhra Pradesh and Gujarat is described in figures 1a, 1b, 2a and 2b. They show the proportion of households in which specific farming decisions are taken and activities carried out, respectively, by men, by both men and women, and by women household members. The patterns appear quite similar in both states. In the majority of irrigated farms, women's activities are confined to unskilled, labor-intensive tasks (L = labor) like weeding, threshing and harvesting and, in Andhra Pradesh, transplanting paddy.[6] In these farms men take up core-tasks like ploughing, application of fertilizers and pesticides, that are essential for overall business, and require investments, technological skills and outside contacts (T = technology-related). Men are also involved in marketing, an activity strongly related to control over the benefits (B = benefit-related). With regard to decision-making, men take most decisions in the majority of households, including those regarding resources (R = resources) such as land and credit. Irrigation is a decision and activity of the same gendered nature as other technology-related decisions and activities. A decision in which slightly more women participate is in the use of produce that is kept at home and, related to that, crop choice. This probably reflects women's roles as housewives and their involvement in estimating future family consumption needs— from which they themselves benefit indirectly. However, their say over the produce does not extend to the decision of marketing produce or to decisions over the use of the money earned.[7] The slightly higher proportion of women who decide about labor exchange probably does so because of their preponderant roles in labor provision.

The majority of women are thus unpaid family laborers, while men are the main irrigators and main decision-makers about the farm, including field irrigation and management. These findings hardly support a policy to promote the option of joint membership in water users associations as a blanket measure intended for all women. Further research is needed to assess whether women's roles as secondary irrigators, for example, in replacing male irrigators or assisting them are considerable. These women may face problems when their rights are only secondary or derivative from their male kin—as they usually are. It is also necessary to study whether concretizing joint membership would solve these problems.

The minority of women farm decision-makers

Figures 1a, 1b, 2a and 2b also highlight that there is a minority of women farm decision-makers in both Andhra Pradesh and Gujarat. Three variables that influence women to become farm decision-makers were identified. Female headship of the farm household has the strongest impact on women's roles in decision-making, as illustrated in figures 3a, 3b, 4a and 4b. In around 50 percent of the female-headed households, women take most decisions on their own, even though some of these women farm decision-makers leave technology-related tasks to men. In male-headed households women are farm decision-makers in about three percent of the cases only.

A variable that also influences whether women take up farming is women's land ownership (see figures 5a and 5b). In around 30 percent of the farms in which at least one plot is in a woman's name, women take most decisions alone. In the other 70 percent of the farms in which women

[6]The main crops in Gujarat are wheat, mustard and tobacco. Ploughing and sowing are usually done at the same time.

[7]Women may sell small portions to traders who visit houses or regularly put small quantities of produce aside for saving and thus have more say over the use of the produce.

have land registered in their names, men are the farm decision-makers. Various studies in India, Nepal and Sri Lanka mention severe constraints on the ability of women to farm alone, including the lack of social and physical mobility, taboos on interactions with strange men for the purchase of inputs, marketing and loan taking and the dependency upon men for core tasks like ploughing. Primarily because of these constraints, many women landowners hand over actual cultivation to relatives like husbands, sons, or brothers or male sharecroppers and tenants (Agarwal 1994; van der Molen 2001).

A third variable, farm size, also influences women's involvement in farming (see figures 6a and 6b). In around 10 percent of the farms, less than one hectare in size, women take most decisions alone. Men may have other jobs or lack interest or capability to farm. In contrast to this, in larger farms, hardly any woman carries out core farm tasks or makes decisions. Hence, with increasing farm size, labor inputs by women are reduced and women withdraw further from farming.

In absolute numbers in the total sample, women farm decision-makers belong as often to male-headed households as to female-headed households. The chances of finding a woman decision-maker in a female-headed household is higher than in any other type of household. However, the proportion of female-headed households is generally low. Even in this purposively selected sample it is only 7 percent. Also, among women landowners who constitute 8 percent of the sample, three-quarters live in male-headed households. The two studies cited below in Nepal (van Koppen et al. 2001b) and Sri Lanka (van Etten and van Koppen 2001) found that in absolute numbers *most* women farmers belong to male-headed households. Hence, targeting female-headed households to reach women farm decision-makers would mean that two targeting mistakes are made: about half or more of the women heads of households are *not* the farm decision-makers but would be included, and especially women landowners and women in small farms in male-headed households would be overlooked.

Gender Performance of Irrigation Institutions in Male Farming Systems

Here the focus is on the second question of the GPII regarding inclusion or exclusion of the minority of women farm decision-makers in male farming systems at farm, forum and leadership levels. Data from the case study in Andhra Pradesh and Gujarat are complemented by other applications of the Indicator in Nepal and also from related literature. All data confirm moderate or severe exclusion of the few women farm decision-makers. Their exclusion as a minority is firmly embedded in general local arrangements. Therefore, the scope for irrigation agencies and farm leaders to change the situation seems limited. Agencies and women together have to challenge these local arrangements.

The exceptional woman farmer in an environment where most farmers are men faces a range of gender-specific obstacles to farming in general, and participation in irrigation institutions in particular. This was observed in the above-mentioned case study of Andhra Pradesh and Gujarat and also in other studies. As the number of female farm decision-makers is typically small in male farming systems, the studies that document women's exclusion from access to water at farm, forum and leadership levels are mainly qualitative and often concern individual cases. Features of these exclusion processes are summarized in table 5.

FIGURE 1.
Distribution of households (percentage) by gender of decision-maker (1a) and person carrying out activities (1b) Data from Andhra Pradesh.

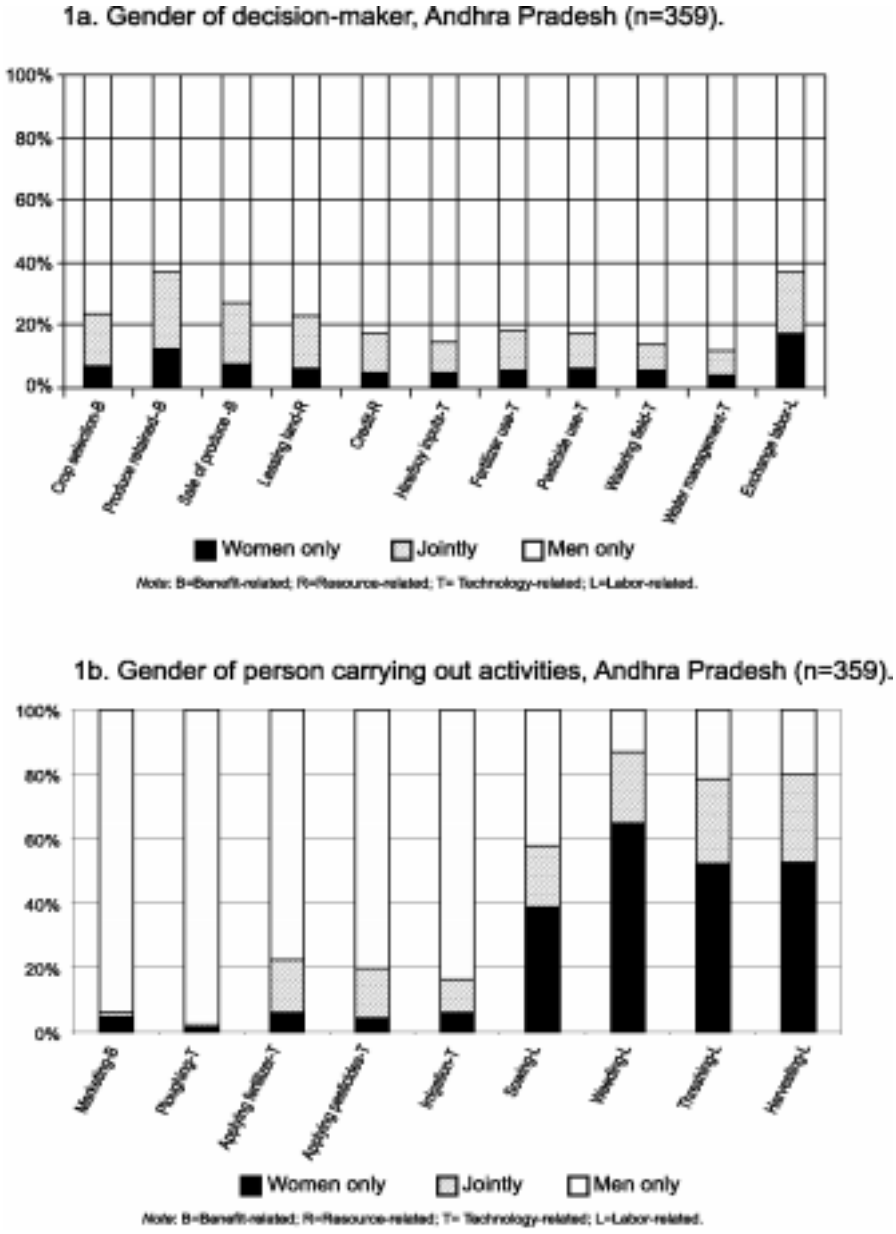
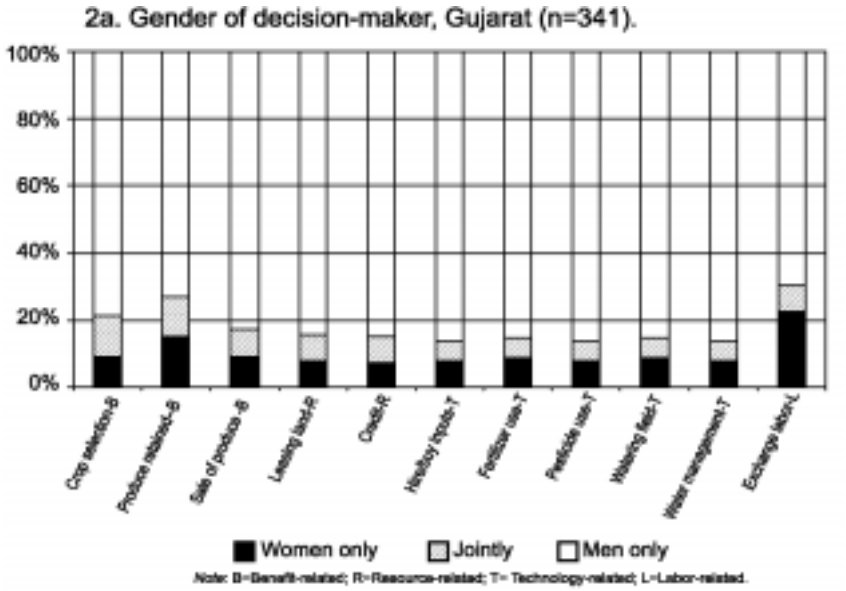


FIGURE 2.
Distribution of households (percentage) by gender of decision-maker (2a) and person carrying out activities (2b) Data from Gujarat.



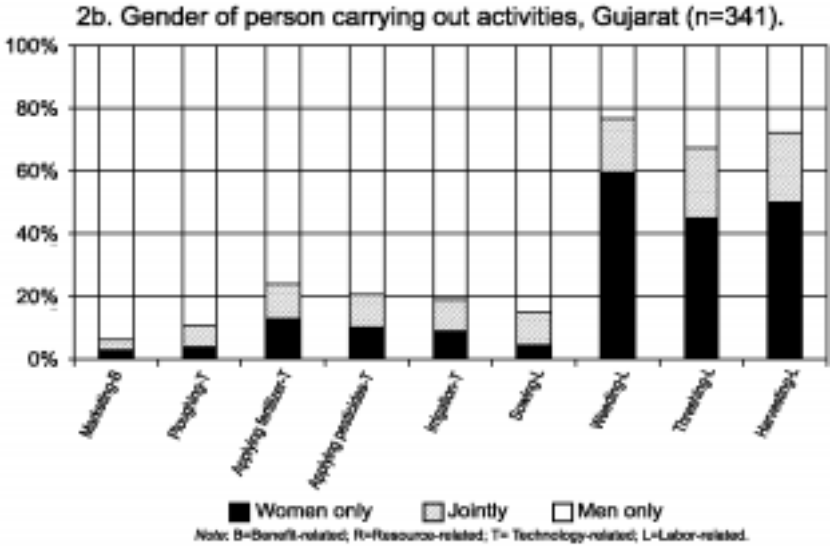
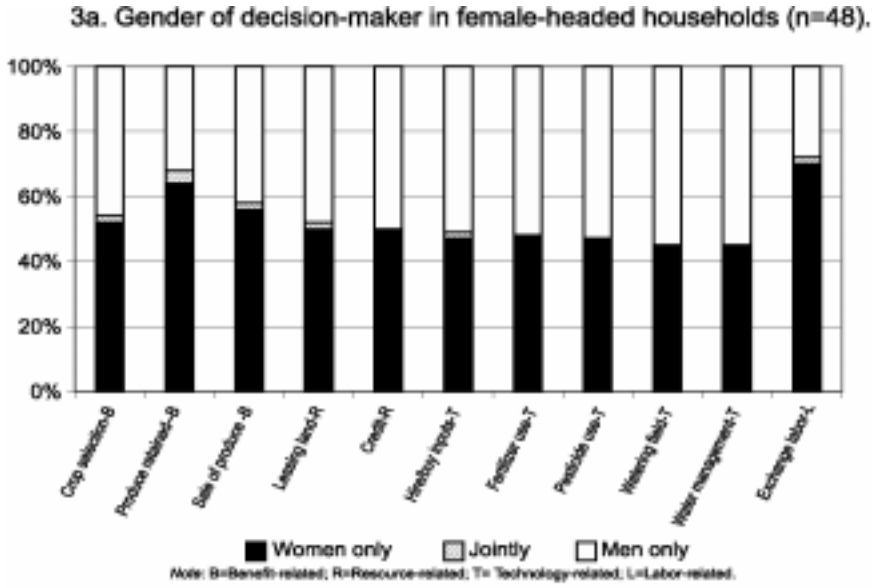


FIGURE 3.
Distribution of households (percentage) by gender of decision-maker in female-headed (3a) vs male-headed (3b) households: Data from Andhra Pradesh and Gujarat.



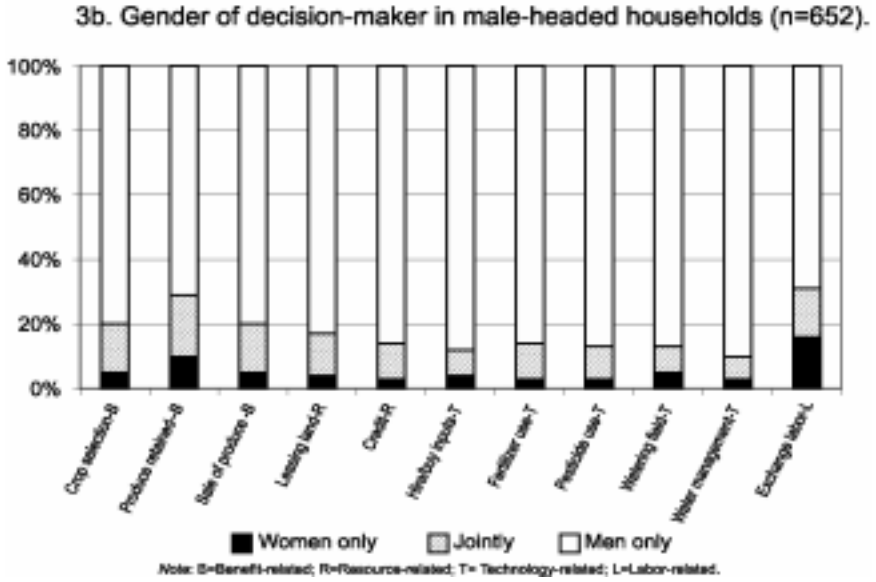
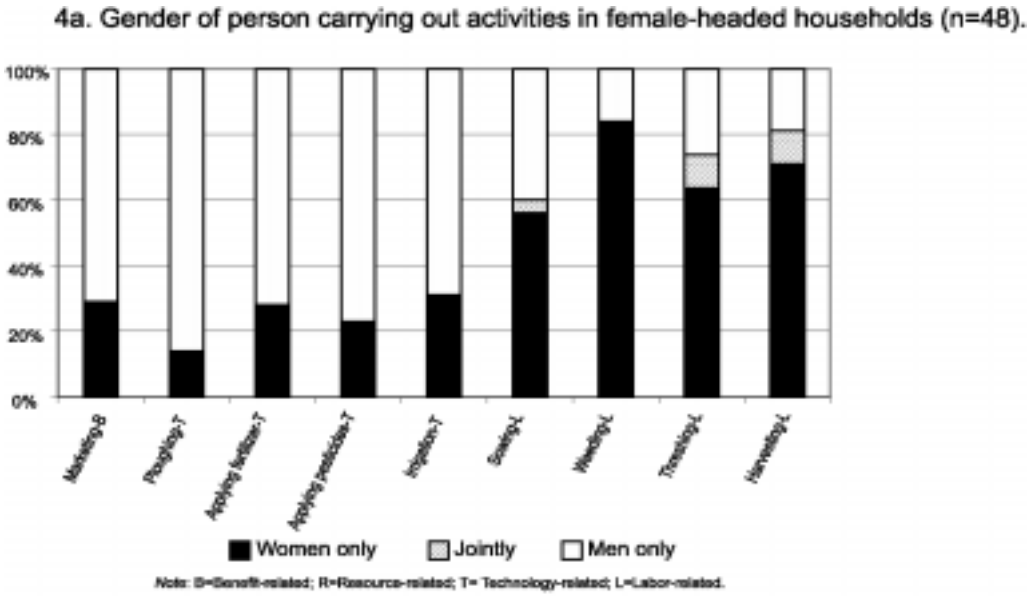


FIGURE 4.
Distribution of households (percentage) by gender of person carrying out activities in female-headed (4a) vs male-headed (4b) households: Data from Andhra Pradesh and Gujarat.



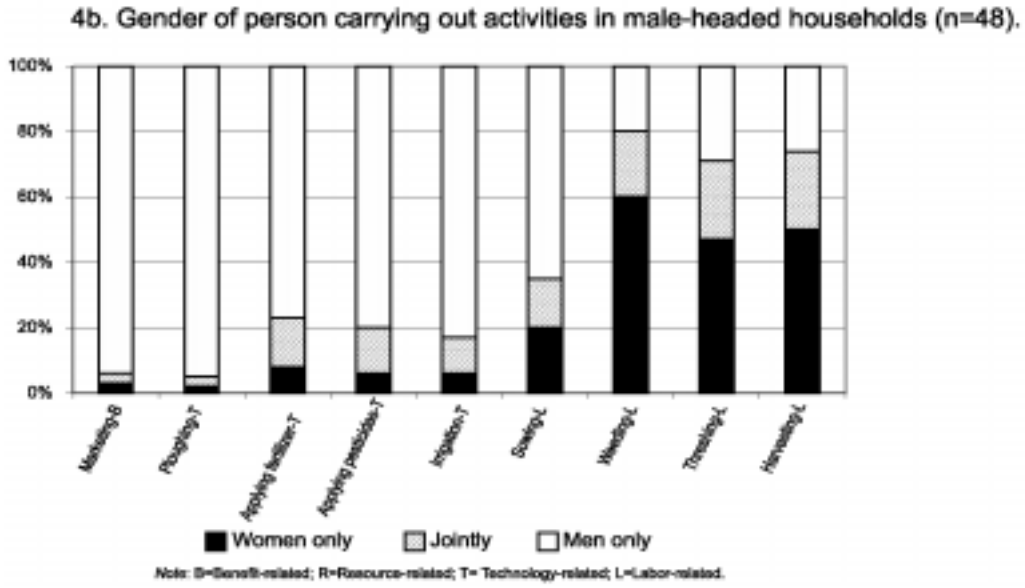
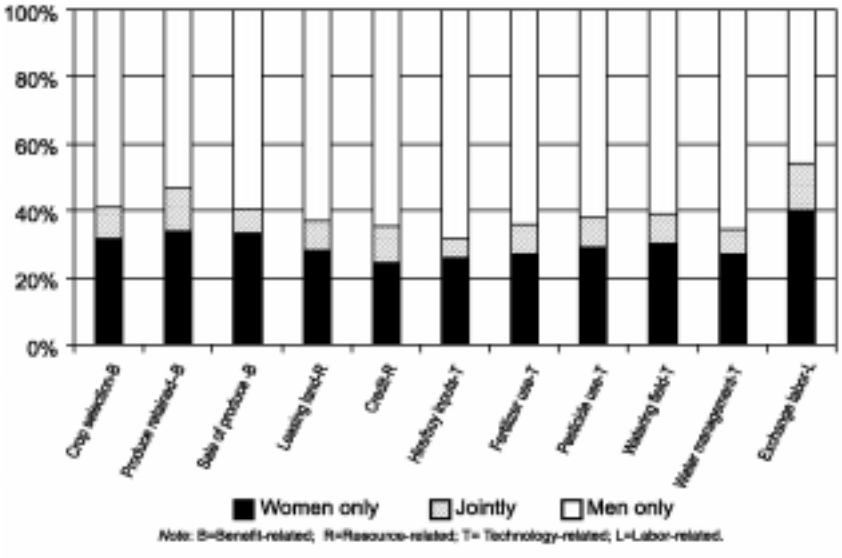


FIGURE 5.
Distribution of households (percentage) by gender of decision-maker in households with female landowner (5a) vs male-landowner (5b): Data from Andhra Pradesh and Gujarat.

5a. Gender of decision-maker in households with female landowner (n=56).



5b. Gender of decision-maker in households with male landowner (n=644).

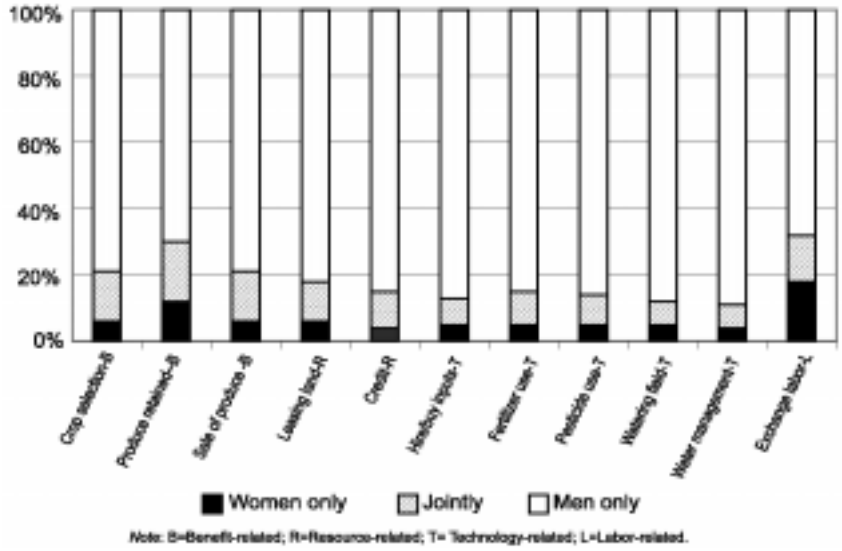
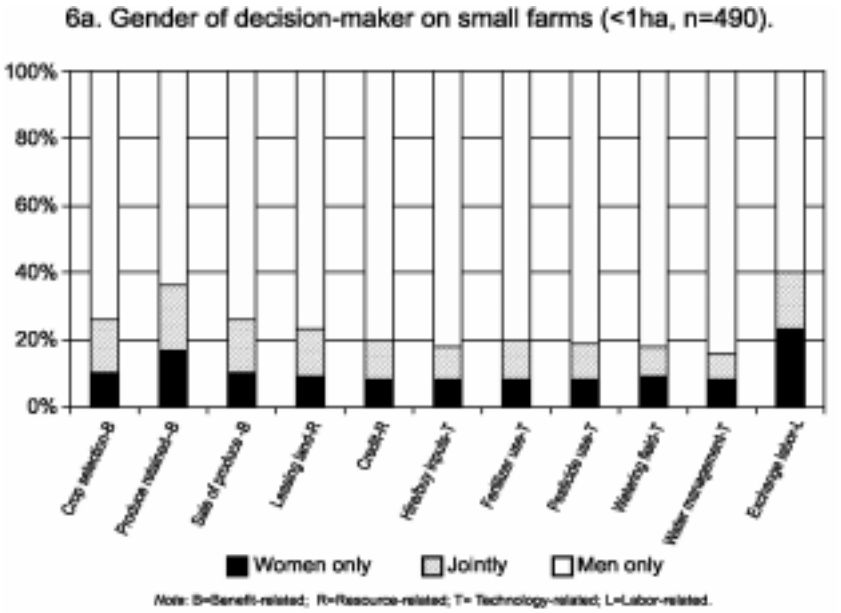


FIGURE 6.
Distribution of households (percentage) by gender of decision-maker on small (6a) vs large farms (6b): Data from Andhra Pradesh and Gujarat.



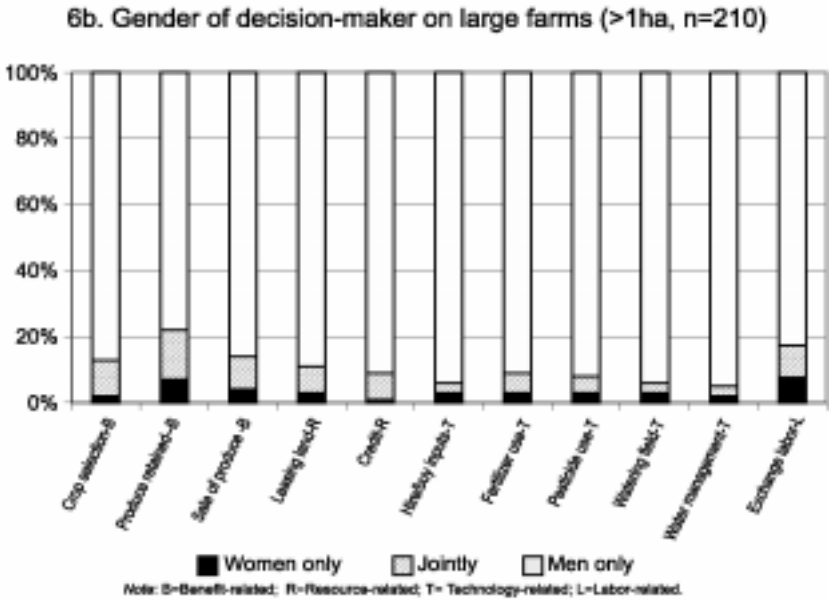


TABLE 5.
The GPII in large-scale canal irrigation in Andhra Pradesh and Gujarat, and elsewhere.

Categorical membership rights of women farm decision-makers without land ownership	Categorical membership rights of women land owners	Concretized water rights at farm level	Concretized inclusion in forums	Concretized inclusion as leaders	Ability to function as leaders
–	+	n.a. or +/–	–	–	–
Main performer: local arrangements					

n.a. = data not available

Categorical Membership Rights

In South Asia, formal water rights and membership of water users associations tend to be vested in landowners. This formal categorical right would empower women landowners who cultivate themselves[8] and also those who give their land on lease. However, this rule formally excludes women farmers and irrigation managers cultivating land of their male in-laws from having water rights, membership of water users associations and eligibility for leadership positions. In the above-mentioned study in Andhra Pradesh and Gujarat, 64 percent of the women farm decision-makers belong to the latter category.

The status of women as wives may give them *de facto* derivative water and membership rights from their absent male kin. However, in the West Gandak irrigation system in Nepal, it appeared that in quite a few households in which women farmed while their husbands (who owned the land) were absent for off-farm employment, nobody had informed women of the allocation and distribution of water rights (shares) or the required payment of irrigation service fees—or their husbands had not been present to arrange purchase of shares.

Offering the option of formal joint water rights and support for implementation seems most relevant for the category of women farm decision-makers cultivating land owned by their male kin. Public legal acknowledgement of their roles as irrigators would strengthen their position and facilitate communication and negotiation with fellow farmers in the water users association on water-related issues at farm, forum and leadership levels.

Concretized Water Rights and Obligations at Farm Level

Data on differences in farm-level access to irrigation water between men and women farm decision-makers in male farming systems are scarce. One of the few quantitative indications that such differences do exist was found in the West Gandak irrigation system in Nepal. Here, strategies for field watering by men and women irrigators during a reference period prior to the survey were compared. It was found that women just take water when it arrives at the intake or arrange among neighboring farmers in 73 percent of the cases, and rarely access water via the

[8]Although water rights are formally vested in landowners, women landowners may be overlooked. In the West Gandak irrigation scheme, water shares were still in men's names. For example, a ten-year old grandson of a widow landowner had shares in his name (van Koppen et al. 2001b).

water users associations. Men irrigators, on the other hand, adopt these informal strategies in only 43 percent of the cases. Most men pass via formal institutions from lower to higher tiers, to negotiate or at least to be informed about the rotation schedules beforehand. The latter strategy enhances farmers' water security. The study in the West Gandak irrigation system also revealed subjective and qualitative indications of gender-based problems in accessing water. Poor women who perceived their bargaining position in water conflicts as weak attributed this to being poor and to being a woman. Both in the West Gandak irrigation system and elsewhere in Nepal, women do irrigate at night, and sometimes even more often than men (von Benda-Beckmann et al. 1997). However, norms in these areas reject night irrigation by women, which may refrain some women from irrigating when needed.

A generic remedy to improve access to water by weaker groups is mentioned in case studies by F. von Benda-Beckmann and K. von Benda-Beckmann (2000) and in van der Schaaf (2000). Water distribution among farmers who share a canal had been changed from disorganized ad hoc taking of water into transparent, predictable rotation. Especially the weaker water users, like women, gained.

Rights to water at farm level are related to obligations. The labor obligations for canal maintenance that water users have to undertake in compensation for water rights pose problems for women of some ethnic groups. For example, in such groups, cultural norms forbid women to do maintenance work (Zwarteveen and Neupane 1996;; Pun 2000; van Koppen et al. 2001b). Especially if enough unemployed male labor is available men should do this work, while women have to pay fines or special fees. Usually, the payments are quite high if not excessively high (Pun 2000). In the Chhatis Mauja scheme in Nepal, women in female-headed households mentioned their problems in fulfilling labor obligations as the major reason for giving land out for sharecropping rather than cultivating it (Zwarteveen and Neupane 1996). Wherever such taboos prevail, gender-sensitive irrigation agencies and leaders should support women in challenging these norms.

In other ethnic groups, the participation of women in construction work, both as family laborers and farm decision-makers, is equal or even higher than men, as found in the above-mentioned large-scale canal irrigation schemes in Andhra Pradesh (but not in Gujarat). However, even if women are main providers of unpaid labor contributions, their contributions tend to be registered and counted in the name of the male head of household (van Etten et al. forthcoming). External agencies and irrigation leaders should consider registration of obligations and contributions in women's own names.

Forums and Leadership

Women farm decision-makers are generally excluded from male-dominated informal networks in which access to water is negotiated, and even more strongly excluded from formal water users associations. Not a single woman in any of the sample households in the study in Andhra Pradesh and Gujarat participated in the activities of the new water users associations—whether women were landowners and therefore formally entitled, or whether they were just farm decision-makers without land titles. Only in one exceptional water users association in Gujarat, where an NGO had been active in the implementation of the irrigation management transfer program, two women participated but only nominally. Similarly, in the West Gandak irrigation system, women reported not being informed let alone being invited for informal and formal meetings. In another case a woman who had been keen to attend had been forbidden to participate by her husband with an off-farm job. According to him, "irrigation is nothing for women." Women's lack of physical and social mobility (Agarwal 1994), norms about appropriate female behavior, risks of indecent proposals and also a gap in education, language, literacy and

information contribute to women's non-participation in forums. If women attend meetings, they usually fail to voice their interests. Male-dominated irrigation forums are 'hostile environments' in Nepal (Zwarteveen and Neupane 1996), so are tank systems in north Sri Lanka (van der Molen 2001) and *subaks* in Bali, Indonesia (Jha 2000).

Predictably, virtually no woman occupies a position in committees in any of the water users associations studied in Andhra Pradesh, Gujarat, or Nepal. Shyamala and Rao confirm this in their study on women in leadership positions of all water users associations in Andhra Pradesh. They found that during the statewide elections of 1997 in all 10,292 water users associations, about 98 women became presidents and 830 women became committee members. As the authors observed, "the majority of these women did not voluntarily enter the water users associations but were pushed into it to function as 'token' members to serve the self interests of their male members (sic) who is either a contractor, a political party activist, an influential person in the village, etc., but cannot directly obtain the position as the land is not in his name." Of the 18 interviewed committee members, 16 had been informed of their selection at a later date (Shyamala and Rao 1999).

In male farming systems the gender performance of irrigation institutions is definitely low. The exclusion of the minority of women farm decision-makers from forums and leadership positions is widespread and strong. Indications also exist that women face more problems than men in accessing water at field level. This low performance is embedded in male-dominated local production relations and male dominance in forums and leadership. The fact that women farm decision-makers are a minority is part of the problem. While local arrangements are 'key performers' in excluding women, the question remains as to what role external irrigation agencies can realistically play in changing this. The applications of the GPII in the West Gandak irrigation system and the Ridiyagama irrigation system provide specific insights into this issue.

The Role of Agencies in Male Farming Systems

Empirical indications of the roles of agencies come from two other applications of the GPII in the West Gandak irrigation system in Nepal (van Koppen et al. 2001b) and the Ridiyagama irrigation system in Sri Lanka (van Etten and van Koppen forthcoming).

Affirmative Action for Women Leaders in the West Gandak Irrigation System, Nepal

In 1997 the 8,700 ha canal irrigation system of West Gandak, Nepal was handed over to a newly established water users association (van Koppen et al. 2001b).[9] The new management of the water users association, supported by the national Department of Irrigation, pioneered in setting up an affirmative action program to stimulate women leadership. In 1997/1998, during the third round of elections it was made compulsory to add one woman member to the committee from the 173 lowest tier bodies, the *Upatolis*. Before, less than one percent of the office bearers in the new water users association were women. After this measure there were women members in 145 *Upatolis*. This increased the proportion of female *Upatoli* members to 12 percent. Moreover, four women from each of the four command area regions were included in the board of directors. Some women were also selected and trained to join the operational structure of the water users association, the Work Force for Canal Management. In all these recruitment processes,

[9]Interviews were held with 64 purposively selected households, out of which 45 were male-headed and 19 were female-headed. Further, 17 male and 13 female committee members of the lowest bodies (*Upatoli*) and highest tier body (Board of Directors) of the water users association were interviewed.

the appointment was basically the decision of one or few sitting committee members. In the West Gandak irrigation system as a whole, only one case could be cited in which a nominated woman committee member functioned so well that male fellow committee members elected her later as the chairperson of their committee.

Table 6 shows the gender performance of this scheme. Unlike the typical gender performance in male farming systems, summarized in table 5, in the West Gandak irrigation system women are included in leadership positions, at least nominally. However, their ability to function is weak—as was evident from the interviews. Most women committee members interviewed felt badly informed. For example, male committee members even refused to give a copy of the constitution of the water users association to them. Women also complained that they were not invited for meetings. Moreover, women still lacked training although the Department of Irrigation had pro-actively started to include women in training and exposure visits to bridge this gap. Most women had no clear idea about their tasks. Some men did not see any task for women, because they felt that women did not and should not irrigate, and because they feared that "women, once they become active, will dominate men." On the other hand, some women committee members felt that they were now more respected within their communities and that their access to water had improved. Some men also said that they appreciated the presence of women because meetings were now more orderly and disciplined.

The recruitment of the women committee members lacked transparency and was decided upon by one or few committee members. Thus, women lacked any endorsement of a constituency while villagers sometimes questioned the credibility of the procedure. Nevertheless, the recruitment procedure appeared rather effective in selecting women farm decision-makers and irrigators who constitute a very small minority of all farm households in the West Gandak irrigation system. Out of the 13 women *Upatoli* committee members interviewed, 6 were the primary irrigators in their farms. Another 5 committee members interviewed irrigated jointly with their husbands. Only 2 women were not involved in agriculture at all, and were primarily appointed by male relatives for political reasons as in Andhra Pradesh. Hardly any female committee member interviewed owned land, even though membership of the water users association was formally connected to landownership. Some husbands had written a letter of consent that their wives could use the husbands' water rights (shares). This self-initiated formalization of spouses' joint water rights adequately confirmed women's *de facto* roles as irrigators, farmers and committee members in that local setting.

TABLE 6.
The GPII in large-scale canal irrigation in West Gandak irrigation system, Nepal.

Categorical membership rights of women farm decision-makers without land ownership	Categorical membership rights of women land owners	Concretized water rights at farm level	Concretized inclusion in forums	Concretized inclusion as leaders	Ability to function as leaders
–	+	+/–	–	+	–
Main performer: agency, challenging local arrangements					

More long-term research in the West Gandak irrigation scheme and more comparative research with innovative affirmative action elsewhere are clearly needed to substantiate any conclusion on the potential impact of the action of agencies and irrigation leaders in male farming systems. Tentatively, the following measures can be proposed to overcome exclusion of women farm decision-makers and women landowners:

- Identifying the dispersed minority of women farm decision-makers.
- Publicly recognizing them as irrigators, for example, through joint membership.
- Explicitly inviting them for meetings.
- Explicitly electing or nominating them in committees, while casting the net wide and rendering the procedure more transparent and credible.
- Assessing women's problems in accessing water and fulfilling obligations and addressing these problems, for example, by better institutionalizing water distribution and challenging cultural norms about women's inability to do construction and maintenance work.
- Stimulating women landowners to concretize their categorical rights.
- Training women farm decision-makers and facilitating cross-visits.
- In short, challenging the rigid norm that irrigation is, *only and exclusively*, a male affair.

While such measures target existing women farm decision-makers and landowners, they may also have a positive effect on households with absent male adults that are currently forced to lease out their land because of the problems women face in farming and in irrigation institutions. Women-friendly irrigation institutions may stimulate women in these households to take up farming and irrigation. Also, in households where adult men with occupations elsewhere have to come back to irrigate and attend meetings, or where sons have to leave schools to irrigate, women may take over these male tasks if irrigation institutions themselves change (Pun 2000). Further intra-household specialization of production along gender lines would serve overall household welfare. This is especially relevant in poor households. The impacts of this type of changes within the mandates of irrigation agencies on intra-household production relations need to be monitored.

The Role of the Agency in a Male Farming System Close to a Dual Farming System in Southern Sri Lanka

The GPII was also applied in the 2,500 ha Ridiyagama, Walawe left bank irrigation scheme in southern Sri Lanka (van Etten and van Koppen forthcoming).[10] Male farming systems generally prevail in Sri Lanka and case studies usually document the exclusion of women from irrigation institutions (Athukorale and Zwarteveen 1994; Kome 1997; van der Molen 2001). However, the performance of the Ridiyagama irrigation system, according to the GPII, is good, at least in the lower tiers (see table 7). No evidence was found

[10] 104 households were selected randomly.

TABLE 7
The GPII in the Ridiyagama irrigation system, Sri Lanka.

Categorical membership rights of women farm decision-makers without land ownership	Categorical membership rights of women land owners	Concretized water rights at farm level	Concretized inclusion in forums (lowest tier)	Concretized inclusion as leaders (lowest tier)	Ability to function as leaders (lowest tier)
–	+	+	+	+/–	+/–
Main performer: local arrangements and agency					

of gender-specific inequities in accessing water at field level. However, this may partly be due to the fact that water was generally quite abundant. Women also participated in local forums, especially in the meetings of the farmer organizations at the lowest tier of the water users association. Among the female farm decision-makers in the sample, 80 percent attended meetings. Among male farm decision-makers this was virtually the same—83 percent. Women land titleholders, as a category, attended meetings, even though a proportion as high as 39 percent of female land titleholders leaves farm decision-making to others. Apparently, in the Ridiyagama irrigation system, women land titleholders are able to concretize their categorical rights at least at the lowest forum levels. At the lowest leadership level, 7 percent of the elected 71 committee members of the federation of 24 farmer organizations are women. Although this proportion is still much lower than the proportion of women farm decision-makers in the scheme, it is probably the highest proportion of women irrigation committee members in Sri Lanka.

Two factors play a role in this rather good gender performance: less male bias in local production and institutional arrangements, and a gender-inclusive intervention approach by the agency. In the randomly selected sample in the Ridiyagama irrigation system 26 percent of the farm decision-makers are women and the land titles (both ownership and tenancy) of 33 percent of the irrigation plots belong to women. This male farming system is close to being a dual farming system. Plausibly, the consequences of being a minority weaken when a critical proportion of women take up farm decision-making. The fact that women have strong land titles in this area contributes as well.

The irrigation management division of the Ministry of Irrigation and Power is the agency that organizes farmers into associations in this area through locally recruited and trained men and women. The division actively supports the newly created farmers' organizations with regular advice on organization, accounting and monitoring. Both the staff of the irrigation management division and these local mediators support women on the same footing as men to become committee members and to function effectively. Recognition of locally prevailing gendered production relations and building upon them, in the manner concluded in the former section on female and dual farming systems, is also a significant factor in the rather good gender performance in the Ridiyagama irrigation system.

Generic Policy Implications

Policy Implications within an Irrigation Mandate

In male farming systems, irrigation agencies that aim to include the minority of women farm decision-makers in irrigation institutions at farm, forum and leadership levels have to challenge norms and practices embedded in male dominance of local production relations and irrigation institutions—in the same manner in which these women themselves have to challenge norms in order to obtain water for their farms. There is certainly a need for effective measures that target the dispersed minority of women farm decision-makers and solve their specific problems as women. This is very different from female and dual farming systems where irrigation agencies merely have to go with local production arrangements rather than disrupting them. However, whereas in female and dual farming systems a good gender performance is a scheme-level productivity issue, a gender-inclusive approach in male farming systems primarily benefits the minority of women concerned. If women decision-makers are a minority, the impact on scheme-level productivity is less.

Policy Implications beyond a Strict Irrigation Mandate

In male farming systems, the majority of women are unpaid family laborers contributing to an enterprise managed by their male kin. As non-entrepreneurs these women have little to gain from intra-household attempts to replace their husbands in negotiations with third parties for water—one of the inputs in the enterprise. In male farming systems the *prior* gender issue for the majority of women is their subordinate position within the household farm. Women's exclusion from farm decision-making in the so-called private sphere of the farm household directly leads to women's exclusion from the public sphere of irrigation institutions. Focusing only on the public sphere cannot solve exclusion from it. All components constituting the gendered nature of farming need to be addressed. Women as a gender need access to the *range* of factors required for a farm enterprise in which water is an input. Access to land, markets, inputs, agricultural technologies, training and credit are as important as water. In a sense, the underlying gender issue is the agrarian structure in a particular society in which men monopolize control over agricultural production factors. This structural cause is overcome only if male farming systems evolve into dual farming systems. Such a gender agenda requires irrigation agencies to foster collaboration with other gender-inclusive rural development initiatives that address the range of factors that women need to access better than they do today. The nature of such a transition will also largely depend upon developments in gender-segmented markets for off-farm employment.

Conclusions

The GPII was developed to compensate for the lack of conceptual tools and methods that are needed to translate gender-sensitive policy intentions at all levels into action. The Indicator aims to:

- Generate generic, quantitative insight on diverse realities that are of direct relevance to irrigation agencies and leaders.

- Capture adequately that water is an input in an encompassing farm enterprise and, therefore, affects women farm decision-makers differently than women family laborers.

- Be applicable both in an intervention and an academic context, albeit at different levels of sophistication.

- Build upon a wide consensus about performance of irrigation and agricultural support institutions—that women's and men's equal access to water or other production factors boosts scheme productivity and women's incomes, along with men's, at least in female and dual farming systems.

The applications of the GPII described above further underline that there is a critical need to apply the tool because implications for irrigation and other change agencies vary significantly. The idea that there would be one globally valid blanket strategy for gender-sensitive intervention in irrigation, such as aiming to include all women in irrigation institutions is an illusion.

The importance of including all women in irrigation institutions, especially at farm and forum levels, is mandatory in female and dual farming systems. This is the responsibility of agencies. In female and dual farming systems, the agency is the primary performer in including women in irrigation institutions. In female and dual farming systems, male kin and male local elite are aware of independent productive roles women play and their water needs. There is little reason for them to oppose agencies that decide to provide water to women's production units. Men may even actively support such initiatives. Evidently, the local elite may try to negotiate with agencies to channel support to their own production units. The outcome of this negotiation also depends largely upon the agency. Assuming standard opposition by local men is a stereotype. In any case, once the decision is taken to provide water to women's production units, the intervening agency itself should directly work with women producers in a bottom-up way, establishing an accountable, member-based organization. It should do so for the sake of scheme productivity.

However, in male farming systems, aiming to include all women in irrigation institutions is bound to be questioned by many men. Also, most women whose male kin are the primary farm managers and irrigators are unlikely to respond positively to such efforts. Deep-rooted, unequal agrarian production relations, hidden in the private domain, deprive women as a gender from control over a range of production factors, including water. Action in the public domain with regard to water alone is ineffective. Instead, the overaching issue in gender mainstreaming in rural development for all rural governmental, non-governmental, and self-organized change agents, including irrigation agencies, is a more equal division of all production factors.

In male farming systems the immediate gender issue for irrigation agencies, which only they can solve, is the exclusion of the minority of women farm decision-makers and women

landowners from irrigation institutions. Gender-sensitive intervention entails:

- Identifying the dispersed minority of women farm decision-makers—in male-headed households as well.

- Assessing the forms of exclusion these women face at farm level (for example, weaker water rights or culture-specific problems in carrying out maintenance work); forum level (for example, limited access to male-dominated informal meeting places, no invitations for formal meetings, no encouragement to speak up and no voting rights for women farm decision-makers without primary land titles, etc.) and leadership level (categorical exclusion).

- Designing, implementing and monitoring affirmative action (for example, joint water rights and membership rights, training and stimulating their public nomination or election into leadership positions, etc.).

As implications of policy and action diverge significantly, according to the gendered nature of local farming, insight in to the latter should be systematically recognized as the basis for any intervention by irrigation agencies. The assumption that farm decision-making coincides with headship of household (if headship is easy to define at all) misguides analysis in female, dual and male farming systems.

To conclude, the GPII highlights that gender *always* needs to be taken into consideration. The challenge for the coming decades is to answer the question *how*.

Appendix A

List of GPII Case Studies

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Postal Address:
P O Box 2075
Colombo
Sri Lanka

Location:
127, Sunil Mawatha
Pelawatta
Battaramulla
Sri Lanka

Tel:
+94-1-787404

Fax:
+94-1-786854

E-mail:
iwmi@cgiar.org

Website:
http://www.iwmi.org

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FUTURE HARVEST
IWMI is a Future Harvest Center supported by the CGIAR

ISSN 1026-0862
ISBN 92-9090-468-2