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Gender Issues in Aquaculture: Learning lessons from the International Crops Research Institute for the Semi-Arid Tropics

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ABSTRACT *Ravula Padmaja and Ma Cynthia Serquina Bantilan draw lessons from gender-based social analysis at International Crops Research Institute for the Semi-Arid Tropics with a particular focus on agriculture. They look at agricultural technology development through a social lens, reflecting on the growing need for a holistic, impact-oriented approach to integrated aquaculture and agricultural research for development based on innovation and cooperation.*

KEYWORDS *empowerment; social analysis; groundnut production technology; social capital; village-level studies*

Aquaculture – an allied activity of agriculture

Millions of people around the world depend on fisheries and aquaculture, directly or indirectly, for their livelihoods (Table 1). As seen from Table 1, an estimated 41 million people worked (part-time or full-time) as fishers and fish farmers in 2004, accounting for 3.1 percent of the 1.36 billion people economically active in agriculture worldwide and representing a growth rate of 35 percent from the corresponding figure of 2.3 percent in 1990. Aquaculture shares many similarities in concept to many land-based agriculture industries, such as cattle farming, and many of the same management techniques are used in aquaculture.

Aquaculture continues to grow more rapidly than all other animal food-producing sectors. According to the FAO (2007) report, this sector has grown globally at an average rate of 8.8 percent per year since 1970, compared with only 1.2 percent for capture fisheries and 2.8 percent for terrestrial farmed meat production systems over the same period. Likewise, the contribution of aquaculture to global supplies of fish and other aquatic animals continues to grow, increasing from 3.9 percent of total production by weight in 1970 to 27.1 percent in 2000 and 32.4 percent in 2004. However, despite continuing growth in Asia's aquaculture, most of the present production techniques are quite rudimentary when compared with fully developed agricultural practices (Williams, 2004).

Women participate as entrepreneurs and they provide labour throughout the production cycle of aquaculture. Important roles of women in aquaculture include attending

Table 1. *World fishers and fish farmers by continent*

	1990	1996	2000	2003	2004
Total					
Africa	1,832	1,950	2,081	2,870	2,852
North and Central America	760	777	891	841	864
South America	730	704	706	689	700
Asia	23,736	28,096	34,103	36,189	36,281
Europe	626	466	766	653	656
Oceania	55	52	49	50	54
World	27,737	32,045	39,495	41,293	41,408
Of which fish farmers[a]					
Africa	3	14	83	117	117
North and Central America	3	6	75	62	64
South America	66	213	194	193	194
Asia	3,738	5,986	8,374	10,155	10,837
Europe	20	27	30	68	73
Oceania	1	1	5	5	4
World	3,832	6,245	8,762	10,599	11,289

Source: FAO (2007)
[a]Data for 1990 and 1995 were reported by only a limited number of countries and therefore are not comparable with those for the following years.

to fish ponds, feeding and harvesting fish, collecting prawn larvae and fish fingerlings, processing and marketing. However, just like in agriculture, empirical evidence of women's roles in aquaculture throughout the world shows patterns of unrecognized, unpaid labour that clouds the economic signals of increasing resource degradation.

International Crops Research Institute for the Semi-Arid Tropics village-level studies: incorporating gender dimensions

There is strong evidence from the literature (IFPRI, 2005) that women play a predominant role in household food security. Gender disaggregated analysis increasingly show evidence that, in the context of diversity in the production patterns, incorporating gender-related concerns makes a difference in achieving higher levels of efficiency and socioeconomic welfare. Given the crucial role women play in food production and provisioning, efforts to increase women's productivity and share of benefits are vital. Results from different studies reveal that making women more productive and hence more effective income earners, enhances their status and security in the family as well as in the community.

In the above context, given the importance of developing gender-sensitive technology options for improving agricultural research for development, International Crops Research Institute for the Semi-Arid Tropics (ICRISAT's) sustained engagement in village-level studies (VLS) was further enhanced with a gender-lens perspective. This longitudinal panel database, which commenced in 1975,[1] provides seminal information, and as such has become a benchmark document for researchers, farmers, development investors and policymakers.

Major studies such as that of Walker and Ryan (1990) illustrate the gender-based division of labour in Indian agriculture, but also suggest that there is no clear evidence in the Indian Semi-Arid

Tropics regarding changes that agricultural technologies could bring into the 'intra-household dynamics of the agricultural households'. To allow analysis of the interface of technology and intra- and inter-household farm dynamics, the newly resumed VLS has been enhanced in early 2000, to address gender roles, responsibilities, access to and control over resources and benefits, and other relevant issues relating to the following questions: How do factors such as gender division of labour in the household affect the technology adoption patterns? How do the different markets for different products relate to gender factors? Additional gender-disaggregated enquiries in the VLS cover the assessment of adoption of improved technologies in the rainfed areas; investment patterns of the rural households; the impact of labour market integration; the role of non-farm economy in sustaining the rural households; the impact of government programmes; evolution of social networks, the assessment of poverty and nutrition standards; and the role of migration as a risk-coping strategy. These gender-disaggregated enquiries throw light onto the likely or major factors affecting the production/farming outcomes for all members of the household. Considerable importance is attributed to 'gender-based social analysis' with the Institute's commitment to equity, along with its pursuit of poverty reduction and its attention to the different avenues by which men and women benefit from research.

Gender-based social analysis at ICRISAT

The insights from the VLS reveal that gender is an important variable in agricultural research and that gender analysis is an effective tool in focusing on inter- and intra-household dynamics and equity issues. In order to elucidate the gender dynamics and differential effects in different facets of technology development and uptake process, three case studies were undertaken at ICRISAT. This article focuses on one of them: *ex post* gender analysis of Groundnut Production Technology (GPT) impacts, and explored the implication of this learning to gender issues in aquaculture production.

The GPT technology package consisted of ICRISAT groundnut varieties, suitable for an irrigated summer crop, application of gypsum, micronutrients, sprinkler irrigation on broadbed and furrow systems, and seed management. The study team was interdisciplinary in composition including social scientists, groundnut breeders and entomologists. The long-term observations on uptake and impacts involved the development of suitable approaches for assessing various dimensions of impact from the GPT innovation over an eleven-year period from 1992 to 2003.

Participatory Rural Appraisals (PRAs) and Rapid Rural Appraisals were adopted, along with individual interviews, to interact more closely with male and female farmers to assess their perceptions regarding the new technology, evaluate their needs in view of the changes resulting from technology introduction and assess impacts – economic, environmental and social. Focus group meetings and key informant interviews were complemented by gender and social analysis tools adapted from the World Bank (2001). The qualitative analysis derived from focus group meetings and participatory rural appraisals helped understand the linkages between technology adoption and impacts, and the processes and intervening factors involved in these linkages. They gave insights on the key issues underlying the various dimensions of the technology uptake process and build up of social capital leading to empowerment of men and women and the community at large.

The gender analysis of the GPT uptake process revealed that adoption of this new technology enhanced task specialization where activities were performed exclusively by a particular gender in order to optimize available household labour resources (Kolli and Bantilan, 1997). The analysis also confirmed the increased time allocation of women – both family and hired – for the cultivation of groundnuts due to the enhanced task specialization and correspondingly increasing labour demand (sowing by dibbling method, weeding, harvesting and shelling of groundnut pods). Higher yields from GPT allowed households to diversify their use of the products of the groundnut crop. In this process, women gained control over the products retained for household

use. Men were mostly concerned about financial viability of the technology, whereas women perceived the advantage of the new technology options in terms of workability and implications for drudgery and occupational hazards.

The PRAs conducted to ascertain men's and women's (from both farm as well as labour households) preferences and specific needs after experiencing technology intervention were marked by contradictions pointing out a clear polarization between farmers and labourers, as shown in Table 2. The most interesting aspect of this is the conflicts between farmer and labourer groups of women. An example is the persistent demand for a groundnut sheller, which reflects the needs of female farmers for labour-saving equipment, but which directly clashes with the interests of women of agricultural labour households (Kolli and Sanghi, 1994).

Significant impacts on a number of welfare indicators relevant to diverse social groups were evident from the participatory rural appraisals and structured surveys undertaken for the GPT study. A stream of benefits was derived, especially by women, from the wide adoption of the GPT. Direct and indirect benefits are seen in terms of increases in on-farm yields and income, which were translated in terms of changes in women's welfare. The most interesting change was the build up of social capital (referred to as the ability of male and female farmers to develop and use various kinds of social networks) as a result of adoption of the technology. There was a dynamic interplay between individuals (within and among households) and institutions in the community, with evolving relationships and gender-differentiated access, allocation and control of resources. This identified gender-differentiated social constraints, risk and opportunities for more relevant and responsive social development interventions.

Qualitative analysis of the data derived from focus group meetings revealed that the technology uptake process was hastened with the build up of social capital, whereby the men and women from all class and caste groups come together through the formation of kinship and formal networks, farmers groups and self-help groups (SHGs) among small- and medium-scale land-holding farmers, landless and tribal women. More organized collective action helped to overcome the constraints to technology adoption, including access to information and credit, as well as to

Table 2. *Effects of GPT Intervention on Different Groups of Households*

Technology	Farm households		Labour households	
	Men	Women	Men	Women
Supplied				
ICRISAT varieties	+	+	+	+
BBF system	–	+	+	+
Dibbling	+	–	+	+
Sprinkler	+	+	+	NA
Demanded				
BBF maker	+	+	–	–
Dibbler	+	+	NA	–
Harvesting equipment	+	+	–	–
ULV sprayer	+	NA	+	NA
Sheller	+	+	NA	–
Short duration drought resistant varieties	+	+	NA	NA

Source: Kolli and Sanghi (1994) based on ICRISAT gender analysis surveys, 1992–1993

inputs like seed and gypsum fertilizer. In this case, social networks effectively facilitated large-scale adoption and resulted in positive impacts, not only in terms of higher yields and incomes for both farm and labour households, but also in terms of social and cultural dimensions (Padmaja *et al.*, 2006; Bantilan and Padmaja, 2008).

A remarkable outcome observed in this case study was the shattering of the sharp class and caste distinctions for the larger benefit of the whole village. Collective action was enhanced with the increased involvement and participation of women in technology uptake. Kinship, community and other informal networks initially played a crucial role in the diffusion of the technology and in the production and distribution of seeds. Strong kinship ties were developed among diverse classes all over the village including among landless tribal women, which was the primary source of labour in this community. In sharing and distributing improved seeds, members of a kinship group were given preference, and in this way these varieties also spread to other villages through, for instance, daughters who had been married into families in other areas, and by distributing to other kin group members. Kinship ties also played a major role in dissemination of information regarding the GPT. The build up of social capital across social classes and gender through technology adoption and vice versa achieved sustainable impacts, especially in establishing gender equity through access to and distribution of resources among male and female members in the households.

Gender relations played a significant role in mediating the translation of economic benefits derived from technological uptake into individual well-being. The differing social networks and correspondingly different levels of access to information led to men and women experiencing different consequences. A good example was the access to various resources (e.g. sharing tools and implements required for sprinkler irrigation and the broadbed and furrow cultivation), for technology adoption by women, especially from the female-headed households. Research also found that when the right institutional and programme support was available, marginal and small land-holding farmers also saved for productive asset-oriented investments such as children's education, housing and equipment, among others. For example, the farmers' realization for the need for group action led to the transformation of informal groups to formal networks like the *Krishi Vikas Mandal*, a farmers group with an appointed leader, secretary and other officials. Women's participation during the earlier years was minimal. In the meantime, female members of the community were coming together as a group for other purposes like religious events and pooling of resources through mutual savings. These informal associations among women have slowly evolved into a common source of saving for the female members in the community. These groups were later formalized into SHGs with the assistance of the government through the DWCRA programme (Development of Women and Children in Rural Areas).

Given that the GPT is a complex technology requiring close supervision, care and labour, its adoption in the village Umra in Maharashtra, India motivated group action and the development of better relations among members of the community, especially among adivasi (*tribal*) women and men, who were the main source of labour. Better social and political relations were an outcome of technology adoption since everyone stood to gain from it. Parthasarathy and Chopde (2000) confirm that the male and female farmers in the village also displayed a rare willingness to join hands in repaying their long-term debts and investing in production-enhancing assets to improve their credit worthiness. Focus group meetings and key informant interviews also revealed that women and the underprivileged class, especially landless *tribal* women, not only gained higher wages and year-round employment, but also were able to bargain for higher wages and acquire political strength and a voice in decision-making at the household and community levels.

In summary, the research findings indicate differential impacts among households and among women. Activities performed for GPT vary by gender within households, and, correspondingly,

the benefits derived from the use of this technology differed among groups. Among landless households, the primary benefits come from the increased demand for hired female labour and therefore paid employment. For the land-owning households, the findings reveal that increase in production resulting from new varieties and technologies has led to increases in household income, where a small part of this income is shared with women for household provisions (e.g. groundnut oil for home consumption), but a greater workload for women in processing the increased production.

The agriculture–aquaculture analogy

As in agriculture, where most farmers, especially the marginal and small landowners do not have access to resources, information and technology, aquaculture farmers are also constrained by the lack of access to critical financial and capital resources and other inputs. Hence, analogies can be drawn between the two sectors.

As observed from the GPT case study as well as other studies in agriculture, there are binding constraints on women's active participation in aquaculture, that is, their traditional status at the household level, the strict gender division of labour, religious-cultural norms and values, and the extent to which these traditional customs prevail and influence women. Sullivan (2005) found that, as in agriculture, women who had adopted fish farming gained not only financial standing but also social status and prestige, especially in permanent female-headed households where they were either divorced or widowed. Some women are not only involved in aquaculture but also in many other activities, such as raising poultry and livestock, home gardening and family welfare work at home. As a result, the total time engaged by women in aquaculture production and household chores was found to be generally higher than that of men.

Conclusion

- A characterization of gender roles in different environments helps not only in understanding these roles but also in targeting which activities performed by women require immediate technology-oriented priorities.
- It is important to identify those women in agriculture and aquaculture who are workers as well as managers of their farms and who find it difficult to manage their farms in the existing institutional structure. Such groups require special attention and separate strategies.
- In mainstreaming gender in the research agenda, it is important to take into account the livelihood options and the potential access/assets that women in poor households also have. Their empowerment may involve new alternatives and gender-differentiated innovations, skills and knowledge. Acknowledging the role of social capital in the nexus of technology exchange presents both substantial challenges and opportunities to understand complex gender relationships.

To benefit women and men equally in agriculture/aquaculture it is vital to understand the gender-differentiated needs for technology, skills, knowledge and information, as well as the new alternatives in both local cultural and global settings. In mainstreaming gender into the evolving research-for-development agenda, it is essential to take into account simultaneously the livelihood options of men and women, including their assets, access to resources and evolving sociocultural roles. Moreover, the effects of globalization has created a pressing need to find alternative sources of income in situations where traditional means are no longer economically viable, and this requires that research in agriculture and aquaculture must go beyond adjusting technology to fit with the traditional responsibilities and constraints faced by poor male and female farmers.

Note

1 ICRISAT's VLS ran in rural India from 1975 to 1985 and restarted in 2002 and have been an unparalleled source of information to inform development strategies for the region and to truly transform development economics and

development studies more broadly. In 1975, six Indian villages, namely Aurepalle and Dokur in Andhra Pradesh, and Shirapur, Kalman, Kanzara and Kinkheda in Maharashtra, were selected by ICRISAT as the starting point for this initiative. The VLS was subsequently extended to Burkina Faso in Africa. The main purpose of VLS was to understand the socioeconomic conditions of people living in the SAT. This socioeconomic and agrobiological exercise culminated in a landmark database on rural households in the SAT of India and West Africa. For more detailed information on VLS log on to http://www.icrisat.org/gt-mpi/knowledgeBase/Databases/vls.asp.

References

Bantilan, Ma Cynthia S. and Ravula Padmaja (2008) 'Empowerment Through Social Capital Build-up: Gender dimensions through technology uptake', *Experimental Agriculture* 44(1): 61–80.

FAO (2007) *The State of World Fisheries and Aquaculture-2006*, 180 pp. Rome: Food and Agriculture Organization of the United Nations.

International Food Policy Research Institute (IFPRI) (2005) *Women Still the Key to Food and Nutrition Security*, Washington, DC, USA: IFPRI.

Kolli, Rama Devi and Nand Kishore Sanghi (1994) 'Gender Analysis of Technologies in the Indian SAT Agriculture', Paper given at a workshop in National Academy of Agricultural Research Management, Rajendranagar, Andhra Pradesh, India.

Kolli, Rama Devi and Ma Cynthia Serquina Bantilan (1997) 'Gender-Related Impacts of Improved Agricultural Technologies: Identification of indicators from a case study', *Gender Technology and Development* 1(3): 371–93.

Padmaja, Ravula, Ma Cynthia Serquina Bantilan, Devanathan Parthasarathy and Bhavanirajan Valentine Joseph Gandhi (2006) 'Gender and Social Capital Mediated Technology Uptake', Impact series 12. Patancheru 502 324, Andhra Pradesh, India: International Crops Research Institute for the Semi-Arid Tropics, 48 pp.

Parthasarathy, Devanathan and Vishwanath Kisan Chopde (2000) 'Building Social Capital: Collective action, Adoption of Agricultural Innovations, and Poverty Reduction in the Indian Semi-Arid Tropics', Paper given at 'Second Global Development Network' conference, Tokyo, Japan, 11–13 December.

Sullivan, Leah (2005) *The Impacts of Aquaculture: Development in Relation to Gender in Northeastern Thailand*, Bangkok, Thailand: Asian Institute of Technology.

Walker, Thomas and James Ryan (1990) *Village and Household Economies in India's Semi-Arid Tropics*, 394 pp, Baltimore, MD, USA: Johns Hopkins University Press.

Williams, Meryl J. (2004) 'World Fish Supplies, Outlook and Food Security', in Alan Gordon Brown (ed.) *Fish Aquaculture and Food Security – Sustaining Fish a Food Supply*, Crawford, Australia: Gippsland Aquaculture Industry Network.

World Bank (2001) *Social Analysis Source Book*, Washington, DC: The World Bank.