

INVOLVEMENT OF RURAL WOMEN IN UTILIZATION AND MANAGEMENT OF RENEWABLE NATURAL RESOURCES IN KANDI AREA OF PUNJAB

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ABSTRACT

As primary managers and users of natural resources women play a crucial role in sustaining natural resources. It was against this backdrop that the present investigation 'Involvement of rural women in utilization and management of renewable natural resources was carried out in kandi area of Punjab'. Kandi area was specifically selected due to its rich biodiversity and involvement of women in management of natural resources. Simple random sampling technique was employed to draw a sample of 100 women. The data were analyzed using frequencies, percentages, means, and regression analysis. SWOT (Strength, weakness, opportunities and threat) analysis was attempted to explore the strengths, weaknesses, opportunities and threats faced by the respondents for managing RNRs. Majority of low socio-economic status families spent more time and covered greater distance to gather fuel, fodder and water than medium and high socio-economic status families. It can be attributed to greater dependence of low socio-economic families on RNRs as compared to high socio-economic status families who use other sources of fuels like LPG (*Liquid petroleum gas*), electric gadgets and kerosene and consequently, depend less on natural sources of fuel. The data further revealed that low socio-economic families consume water much less than the recommended quantity even with the average family size among this category of respondents being bigger over the medium and high socio-economic status families. Also, the high and medium socio-economic status families due to owning of land had better access to fodder for their animals than the landless low socio-economic status families. Also, the size and type of animals may be the contributory factors for more fodder consumption by animals in these categories of families. Respondents also gave their perception regarding strength, weakness, opportunities and threats with respect to water, fodder and fuel.

KEYWORDS: Kandi Area, Management, Natural Resources, Punjab, Rural Women

INTRODUCTION

Renewable resource management is an emerging field focusing on the ecosystem structures and processes required to sustain the delivery of ecosystem goods and services such as food, clean water and air, essential nutrients, and the provision of beauty and inspiration¹. Thus, management of natural resources is one of the most critical challenges facing developing countries today. The increasing pressure on land, water and other resources exacerbated by degradation, population growth and climate change is giving rise to new problems of natural resource management²⁻³.

If natural resource management from a global perspective is viewed, naturally, women come in the forefront of the race for protection and preservation of the resources. As primary managers and users of natural resources, women have a key role to play in sustaining natural resources⁴⁻⁶. However, they remain largely excluded from owning land, benefiting

from resource wealth or participating in decision-making about resource management, which is clearly a missed opportunity⁷⁻⁸. In natural resource management, there are differences between the roles and responsibilities of men and women due to the socially constructed division of labour. However, for sustainable development and preservation of natural resources, both men and women should be equally responsible as women's' participation in management of natural resources is a time tested way of preserving the eco-biodiversity⁹⁻¹⁰. Indeed, development can only be achieved when both men and women have access, control and benefit from natural resources in an equitable and sustainable way.

Traditional practices and bureaucratic factors that often prevent them access to natural resource development and management must be removed so as to enable them to manage the wealth of natural resource in a better and effective manner. The focus of the present study was therefore to explore utilization and management pattern of natural resources by rural women in the *kandi* area of Punjab.

MATERIALS AND METHODS

Locale of the Study

The study was conducted in *kandi* area of Punjab. *Kandi* area falls in sub mountainous undulating zone which stands along eastern border and lies between Chandigarh, Hoshiarpur, Dasuya, Mukerian road and the Shivalik foot hills of Punjab. The area has been selected because of its rich biodiversity, rainwater resource, suitability for forestry etc. Besides, women in this area enjoy an intimate relationship with agriculture and animal husbandry operations and participate in a huge way in these operations. Out of this area Nawanshahr (Shaheed Bhagat Singh Nagar) district was selected by application of simple random sampling technique. There are total five blocks in this district i.e. Aur, Nawanshahr, Balachaur, Saroya and Banga out of which one block i.e. Balachaur was selected randomly. From the selected block, one village i.e. *Takarla* was purposively selected due to its proximity to forest large size, easy access and availability of natural resources to rural women. From the selected village, a sample of 100 women who were engaged in managing and utilizing the natural resources at household level was drawn through simple random sampling technique. The data were collected using interview schedules as well as PRA techniques like historical time line, transactional walk, seasonal diagramming / calendar, resource mapping, do-it-yourself, daily routine diagram, chappati or venn diagram, mobility map and time trend. Management of natural resources was measured with the help of SWOT (Strength, Weakness, Opportunities and threat) analysis; utilization was measured according to the different categories of socio economic status. Data was analyzed using frequencies, percentages, means and regression coefficient.

RESULTS AND DISCUSSIONS

Socio Economic Profile of Respondents

The socio-personal profile of selected respondents in respect of their age, family type, family size, education level, land holdings, herd size and socio-economic status were studied (Table 1). Socio-economic status was categorized into three categories i.e. low, medium and high. The findings revealed that majority (38%) of the respondents belonged to low socio-economic status followed by 33 percent who belonged to medium socio-economic status and 29 per cent were from high socio-economic status. Majority (68%) of the respondents belonged to middle age. It is evident from the data that majority of the respondents (59%) belonged to nuclear family. Regarding the size of the family, the findings revealed that the respondents were more or less equally distributed in small, medium and large family size. The results showed that one fourth of the respondents were matriculating (25%) while one fourth was either graduate / post graduate (25%).

Land is one of the most important assets with a potential to yield income, data revealed that majority respondents had small land holdings followed by 21 percent having marginal land. Further, almost half of the respondents (49%) had medium herd size followed by 27 percent who possessed large herd size and 19 percent possessed small herd size. Only 5 percent of the respondents reportedly were without livestock.

Table 1: Socio Economic Profile of Respondents

Particulars	Category	Frequency	Percentage
Socio Economic Status	Low	38	38.00
	Medium	33	33.00
	High	29	29.00
Age	Young age (18 to 35 years)	9	9.00
	Middle age (36 to 55 years)	68	68.00
	Old age (above 55 years)	23	23.00
Family Type	Joint	41	41.00
	Nuclear	59	59.00
Family Size	Small (up to 4 members)	33	33.00
	Medium (5 to 8 members)	30	30.00
	Large (> 8 members)	37	37.00
Education Level	Illiterate	20	20.00
	Can read and write	10	10.00
	Primary (up to 5th)	15	15.00
	Middle (Up to 8th)	5	5.00
	Matric (10th)	25	25.00
	Graduation	15	15.00
	Post graduation	10	10.00
Land Holdings	Landless	5	5.00
	Marginal (< 2.5 acre)	21	21.00
	Small (2.5 to 5 acre)	51	51.00
	Medium (5 to 10 acre)	15	15.00
	Large (> 10 acre)	8	8.00
Herd Size	No livestock	5	5.00
	Small herd size (1-3 milch animals or 10 small animals)	19	19.00
	Medium herd size (4 to 6 milch animals or 20 small animals)	49	49.00
	Large herd size (> 6 milch animals or > 21 small animals)	27	27.00

Utilization of Natural Resources by Rural Women

Domestic Use of Water

As reported earlier the main sources of water were tap water supply through water works, community wells and submersible pump. The water is procured for drinking, cooking, washing of utensils and bathing (especially for ladies, old people and infants in the families). The washing of clothes and watering of animals was mostly done at the water site.

The data in Table 2 revealed that the average per capita use of water across various socio-economic status categories was 14 litres for low, 27 litres for the medium and 44 litres for the high socio-economic status respondents. The per capita use of water ranged between 8 to 22 litres among low socio-economic status respondents. The corresponding figures for medium and high socio-economic status respondents were between 18 to 42 litres and 28 to 72 litres respectively.

At the household level the average use was calculated at 140,190 and 220 litres for low, medium and high socio-economic status families respectively. The average family size was bigger among low socio-economic status families (10 member per family) than in medium (7 member per family) and high socio-economic status families (5 member per family).

Per capita consumption of water was found to be low among both low (14 litres) and medium socio-economic categories (27 litres) in comparison to the recommended use of 40 litres per capita per day by WHO (1981). The data further revealed the criticality of situation among low socio-economic families as they were found to consume much less than the recommended quantity even with the average family size among this category of respondents being bigger over the medium and high socio-economic status families.

Domestic Use of Fuel

Table 3 demonstrates domestic use of fuel i.e. wood, agro waste and cow dung cakes. The use of natural fuel was 4kg/capita/day among low socio-economic status families as compared to 5 kg/capita/day for medium and 3kg/capita/day for high socio-economic status categories of the respondents. The range of use of natural fuel was 2 to 6 kg per day among low, 1 to 7 kg among medium and 0 to 5 kg among high socio-economic status families. The average household consumption of fuel was 35 kg among low socio-economic status category, 38 kg among medium and 24 kg among high socio-economic categories. The range of household use was 15 to 45 kg per day among low, 17 to 46 kg per day among medium and 12 to 36 kg per day among high socio-economic status families. These results may be attributed to large family size of medium socio-economic status category of respondents due to which they had to cook more to meet their requirements. The high socio-economic status families were using other sources of fuel like LPG, electric gadgets and kerosene and consequently, depend less on natural sources of fuel. The low socio economic status families were using less fuel inspile of their large family size as they cook only two meals a day.

Domestic Use of Fodder

Only green fodder was considered for this analysis. Data in Table 4 revealed that use of green fodder for animals was more in high (23 kg / day) and medium (21 kg / day) socio-economic status families over low (12 kg / day) socio-economic status respondents. The average range of fodder available across the different socio-economic status groups was 12 to 33 kg per day in high socio-economic status as compared to medium (11 to 32 kg per day) and low socio-economic status families (6 to 18 kg per day). The household use of fodder per day was 45 kg in high, 38 kg in medium and 24 kg in low socio-economic status families.

It can be inferred that high and medium socio-economic status families due to owning of land had better access to fodder for their animals than the low socio-economic status families (who were landless). Also, the size and type of animals may be the contributory factors for more fodder consumption by animals in these categories of families.

Table 2: Domestic Use of Water According to Socio-Economic Status of the Respondents (n=100)

Socio-Economic Status	Per Capita Use of Water (Litres)		Household Use of Water Per Day (Litres)		Average Size of Household (Members)
	Mean	Range	Mean	Range	
Low	14	8-22	140	78-212	10
Medium	27	18-42	190	120-294	7
High	44	28-72	220	140-360	5

Table 3: Domestic Use of Natural Fuel According to Socio-Economic Status of the Respondents (n=100)

Socio-Economic Status	Per Capita Use of Fuel (Kg)		Household Use of Fuel Per Day (Kg)		Average Size of Household (Members)
	Mean	Range	Mean	Range	
Low	4	2-6	35	15-45	10
Medium	5	1-7	38	17-46	7
High	3	0-5	24	12-36	5

Table 4: Domestic Use of Fodder According to Socio-Economic Status of the Respondents (n=100)

Socio-Economic Status	Per Capita Use of Fodder (Kg)		Household Use of Fodder Per Day (Kg)		Average Size of Household (Members)
	Mean	Range	Mean	Range	
Low	12	6-18	24	16-60	10
Medium	21	11-32	38	25-77	7
High	23	12-33	45	31-89	5

Factors Affecting Consumption of Water, Fuel and Fodder

In order to work out the factors affecting the per capita consumption of water, fuel and fodder, multiple regression analysis and t values were worked out. The results pertaining to these have been presented in Table 5.

Factors Affecting Water Consumption / Utilization

The results in Table 5 regarding factors affecting water consumption reveal that age, education level, land holding and herd size showed no significant association with consumption of water at household level. Family type, family size and socio-economic status indicated significant effect on water consumption. All these variables taken together with R² value 0.6542 at 0.01 level of probability could explain 65.42 per cent variations in consumption of water on account of these factors. It is suggested that if the other variables are kept constant than a unit change in factors indicating significant association with consumption of water, can bring a unit change in consumption of water. The water use practices like bathing of male members and children at water source site might be the reason for such trend in results.

Factors Affecting Fuel Consumption / Utilization

Factors affecting the consumption of fuel were also worked out by multiple regressions with independent variables. It was observed that age, family type, education level, herd size do not affect the per capita fuel consumption. Further, family size and land holdings significantly impacted consumption at household level. The co-efficient of determination (R² = 0.5785) explain 57.85 per cent variation in consumption of fuel on account of these variables. It is implied that if all other variables are kept constant than a unit change in factors indicating significant association with consumption of fuel can bring about a unit change in fuel consumption at household level.

Factors Affecting Fodder Consumption / Utilization

Socio-economic status, land holdings and herd size significantly affected the consumption of fodder at house hold level. Rest of the variables showed no significant effect. It may be inferred that all these variables put together (R² = 0.5668) at 0.01level of probability could explain 56.68 per cent variations in consumption of fodder at house hold level.

Table 5: Multiple Regression Factors Influencing Water, Fuel and Fodder Consumption

Factors	Regression Coefficient		
	Water	Fuel	Fodder
Age	0.221	0.153	0.451
Family type	0.002*	0.022	0.33
Family size	0.003*	0.004*	0.117
Education level	0.225	0.345	0.245
Land holdings	0.134	0.075*	0.122*
Herd size	0.114	0.212	0.011*
Socio economic status	0.021*	0.081	0.037*
R ²	0.6542	0.5785	0.5668

*Significant-0.01 level

Management of Natural Resources by Rural Women

This aspect was studied so as to analyze the appropriateness of the decisions made by rural women in managing the natural resources and rationalizing the decision making process in the use of natural resources. The three major natural resources namely, water; fuel and fodder largely managed by the rural women in the selected location were studied for this analysis. SWOT (Strength, weakness, opportunities and threat) analysis was attempted for this part of analysis to explore the strengths, weaknesses, opportunities and threats faced by the respondents for managing these resources. The results so obtained are presented as under;

SWOT Analysis of Water Management

As revealed through observations and discussions the women in the study area played a vital role as managers and suppliers of water at household level. They had knowledge of the source location, reliability and quality of water required for varied household purposes. They know the timings of tap water supply, frequency of its storage and quantity of water required for different purposes as they were directly responsible for collecting and using the water at household level.

The results of SWOT analysis in this regard based on perceptions of women respondents are presented in Table 6. The strengths of tap water supply as told by women included its good taste, safe for health and suitable for all household purposes. The weaknesses of tap water supply reportedly included irregular / inadequate supply, low pressure, flow of excess water into streets (causing health problems due to stagnant water) and frequent quarrels / arguments over out of turn filling of vessels etc.

Table 6: SWOT Analysis of Water Resources as Perceived by Women Respondents

Source of Water	Strengths	Weakness	Opportunities	Threats
Tap water supply through water works	<ul style="list-style-type: none"> Safe for health Good in taste Suitable for all domestic purposes 	<ul style="list-style-type: none"> Uncertain and inadequate supply with low pressure Accumulation of water in streets causing mosquitoes and other problems 	<ul style="list-style-type: none"> Saves time and energy which can be invested for other productive purposes 	<ul style="list-style-type: none"> Not self sustaining resource Spread of mosquitoes and flies due to accumulated water Frequent quarrels and clashes due to out of turn use
Community well	<ul style="list-style-type: none"> Safe water Good in taste Free availability (round the clock) 	<ul style="list-style-type: none"> Drawing water from well is drudgery prone activity 	<ul style="list-style-type: none"> Great place for socialization, relaxation and regular conversation 	<ul style="list-style-type: none"> Possibility of unfortunate happenings such as accidents and falls
Pond	<ul style="list-style-type: none"> Natural source of water for animals, birds etc Useful for animal bathing 	<ul style="list-style-type: none"> Lot of time and energy investment in fetching water Unsafe for use - causes health hazards 	<ul style="list-style-type: none"> Possible use for fish farming Possibility of use for plantation at common land sites 	<ul style="list-style-type: none"> Drowning incidents and other accidental falls
Tube well and submersible pump	<ul style="list-style-type: none"> Abundant water supply, less time consuming 	<ul style="list-style-type: none"> Extra cost involved in electricity Frequent power breakdowns 	<ul style="list-style-type: none"> Easy irrigational and domestic use 	<ul style="list-style-type: none"> Depletion of underground water

The opportunities presented include saving of time and energy of women that could be utilized for other productive purposes. The threats perceived were that the water supply system is not self-sustaining. Also, it could be the cause of many health related problems if the concerned departments do not take measures to maintain clean water supply.

SWOT analysis of community well as source of water revealed that its water was considered safe and good in taste. Weaknesses mentioned included; it consumes more time and energy and causes drudgery of bringing water. Opportunities recognized include that it provided them time for socialization, conversation and relaxation during the intervening period. It has 24 hour availability without any worry of power breakdown. Threats perceived in this regard included some unfortunate falls / accidents that might occur due to negligence and pollution of water during rains and no treatment to restore its safe use.

Pond water is perceived as good natural water resource for birds and bathing of animals. It was generally considered unsafe for human consumption. In terms of opportunities the respondents expressed that if provisions were made for occasional cleaning of the ponds then its water can be used for watering the plants and other plantations at community sites. This water can also be used for commercial fish farming by the villagers and money so raised can be utilized for upkeep of this water resource. The major threat in this regard included drowning incidents, accidental falls etc.

SWOT Analysis of Fuel Management

Traditionally as well as in contemporary time's women bear an important responsibility of fuel collection and storage especially in low status families. They use fuel items like wood, cow dung cakes and agro waste as valuable resources to meet domestic energy requirements. They make all decisions related to type of fuel, place of procurement, storage place and mode of cooking. Thus, they could be considered the main planners and managers for fuel resources at household level.

The SWOT analysis revealed that the respondents viewed strengths of wood (which is their major source of fuel) as a smooth burning fuel that emits less smoke and can be stored easily. Major weaknesses included more time and energy demanding, high cost, deposition of soot on utensils and on the house walls etc (Table 7). Opportunities perceived included easy availability and storage without any loss of quality. However, its excessive use can cause great threat to ecology. Cutting of trees to meet wood requirements (without replenishment), irrational thinking and mismanagement are some of the perceived threats leading to escalated cost, scarcity and desertification in future.

Agro waste was reported to be good for igniting fire in mud stoves even during winter and rainy seasons. Its smoke producing quality, causing soot deposition on walls of the house was perceived as a major weakness. Other weaknesses included, gathering agro-waste is a time and labour intensive activity. It emits smoke which is considered a major health hazard causing itching in the eyes and respiratory problems among women and children. The opportunity lies in its free availability without monetary cost. It helps in keeping the insects away from the area where this fuel is burnt. However, its blatant use poses severe threat of soil erosion.

Table 7: SWOT Analysis of Different Fuels for Domestic Use

Type of Fuel	Strengths	Weakness	Opportunities	Threats
Wood	<ul style="list-style-type: none"> Creates less smoke Easy and smooth burning helps in clean cooking Keeps house warm even after cooking 	<ul style="list-style-type: none"> Wood burning causes health hazards Drudgery prove activity causes Deposition of soot on utensils and walls of the house 	<ul style="list-style-type: none"> Easy to store without any loss of quality Cost effective fuel 	<ul style="list-style-type: none"> Causes air pollution and denuding of trees May lead to household accidents if used during winters to keep house warm
Agro waste	<ul style="list-style-type: none"> Good for igniting fire. While using wood and cow dung cakes 	<ul style="list-style-type: none"> Creates more smoke Leads to cataract in the eyes Increases drudgery of women 	<ul style="list-style-type: none"> Keeps the insects away from home 	<ul style="list-style-type: none"> Burning of agro waste causes toxic gases Potential risk of soil erosion
Cow dung cake	<ul style="list-style-type: none"> Good for animal feed Good for slow cooking, boiling and roasting 	<ul style="list-style-type: none"> Increase in health hazards-creates lot of smoke Drudgery of preparing cow dung cakes increases 	<ul style="list-style-type: none"> Keeps the insects away 	<ul style="list-style-type: none"> Loss of valuable manure
Electric gargets	<ul style="list-style-type: none"> Easy, smooth and efficient fuel source 	<ul style="list-style-type: none"> Requires uninterrupted power supply 	<ul style="list-style-type: none"> Permits multitasking to home maker 	<ul style="list-style-type: none"> Hazardous if short circuiting occurs
LPG + Kerosene	<ul style="list-style-type: none"> Easy, efficient and clean burning fuel Hassle free consumption 	<ul style="list-style-type: none"> Requires efficient and timely household delivery 	<ul style="list-style-type: none"> Permits multitasking 	<ul style="list-style-type: none"> Potentially hazardous if leaking occurs or used irresponsibly

Cow dung cakes though, not in much use now, were found easily available and considered as an appropriate fuel for slow and smooth cooking, boiling and heating of food for human and animal consumption. Its threats included lot of smoke creation due to which not found conducive for making chapatias. In terms of opportunities, respondents said it saves money and helps in keeping the insects away from home but threat was perceived in terms of fertilizer loss causing direct nutrient loss to soil and its fertility. LPG and kerosene were considered as clean and efficient fuel but it requires timely delivery. Threats perceived included accidents due to irresponsible use.

SWOT Analysis of Fodder Management

Fodder management such as collection, transportation, chaffing and serving of fodder to animals are the major tasks performed even today by women. They gather grasses, branches, leaves and other agro forest based products as fodder material for their animals / herds. Fodder management especially during summer months is a very tedious job as women devote a lot of time and energy for this purpose.

The SWOT analysis in this regard is presented in Table 8. The analysis revealed that women perceived Barseem and jowar as good and nutritious fodder for the animals as it increases milk yield if fed to mulching animals. Non-availability of barseem and jowar throughout the year was perceived as the major weakness. These crops were considered effective in increasing soil fertility while threats perceived included lesser area under cultivation of other fodder crops. It can be grown as cash crop also.

Table 8: SWOT Analysis of Fodder as Perceived by Women Respondents

Fodder	Strengths	Weakness	Opportunities	Threats
<ul style="list-style-type: none"> Barseem Jawar Bajra 	<ul style="list-style-type: none"> Nutritious animal feed Increases milk production 	<ul style="list-style-type: none"> Causes health hazards like insect bites, cuts, abrasions while cutting Drudgery prone work 	<ul style="list-style-type: none"> Can be grown as cash crop due to its market demand 	<ul style="list-style-type: none"> Requires more water which is a fast dwindling resource Stray animals cause damage
Grass	<ul style="list-style-type: none"> Good animal feed Can be stored in dried form for use during slack season 	<ul style="list-style-type: none"> Cutting causes health hazards Back breaking activity Drudgery prove activity 	<ul style="list-style-type: none"> Reduced chances of forest fires 	<ul style="list-style-type: none"> Increased incidence of soil erosion
Lopping of trees	<ul style="list-style-type: none"> Good for animal health Multipurpose use as fodder and fuel 	<ul style="list-style-type: none"> Health hazards due to climbing on trees for cutting Time consuming and tiresome Causes denuding of trees 	<ul style="list-style-type: none"> Can be used as fuel after drying Available even during drought conditions 	<ul style="list-style-type: none"> Large scale human activity of cutting trees can lead to desertification
Toori	<ul style="list-style-type: none"> Easily available and less costly fodder 	<ul style="list-style-type: none"> Needs to be combined with green fodder 	<ul style="list-style-type: none"> Available round the year 	<ul style="list-style-type: none"> Non use can lead to burning of wheat and rice husk leading to environmental pollution

Grass as fodder was perceived as good for animals and could be dried and stored for long. But health hazards to women, who collect and chop it, were perceived as the weaknesses. The opportunity was seen in terms of saving money. The main threat perceived was depletion of valuable natural resources which prevents soil erosion, as its roots bind soil and prevent nutrient loss.

Lopping of trees was considered a good and nutritious feed that could be stored for use in the slack / lean season. Destruction of trees and health hazards to women were perceived as weaknesses. It could provide both fuel and fodder was perceived as opportunity, where as denuding of trees was perceived as threat in the use of this resource.

CONCLUSIONS

- It was observed that low socio-economic status families procured / consumed less water, fuel and fodder in comparison to the high socio-economic status families.
- Factors like socio-economic status, family size, family type were significantly affecting consumption of water. Family size and land holdings were also found to affect significantly the consumption of fuel among the respondents of the study. Consumption of fodder was found to be affected significantly by socio-economic status, herd size, land holdings of the respondents.
- Majority of low socio-economic status families spent more time and covered greater distance to gather fuel, fodder and water than medium and high socio-economic status families. It can be attributed to greater dependence of low socio-economic families on RNRs as compared to high socio-economic status families who use other sources of fuels like LPG (*Liquid petroleum gas*), electric gadgets and kerosene and consequently, depend less on natural sources of fuel.
- Respondents also gave their perception regarding strength, weakness, opportunities and threats with respect to water, fodder and fuel.

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