BHAGAVATULA CHARITABLE TRUST

HARIPURAM FARM

YELLAMANCHILI - 531 055.

I.D.R.C. WORKSHOP PROCEEDINGS :

JANUARY 29,30 & 31, 1991.

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W O R K S H O P P R O C E E D I N G S :

"TECHNOLOGICAL INTERVENTIONS INTO THE LIVES OF RURAL WOMEN - RESEARCH PERSPECTIVES OF VOLUNTARY AGENCIES."

BHAGAVATULA CHARITABLE TRUST

YELLAMANCHILI, ANDHRA PRADESH, INDIA

AND

INTERNATIONAL DEVELOLPMENT RESEARCH CENTRE

OTTAWA, C A N A D A.

JAN. 29 -31.

BHAGAVATULA CHARITABLE TRUST

HARIPURAM FARM - ANDHRA PRADESH - INDIA.

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C O N T E N T S

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I. INTRODUCTION :

Underlying the various concerns that plague the rural scene in India is the low quality of life, particularly of women. The low level of dissemination and adoption of science and appropriate technology towards improving the lives of rural women is striking. Caught between poverty and heavy work burdens - both in and outside of her home - the life of a rural woman is full of drudgery. Providing for the family's energy needs, processing and preserving most food stuffs are all the woman's responsibility. She is also the prime source of nutrition and health care.

Voluntary agencies the world over, recognised as invaluable support for rural development, have concerned themselves with channeling some development programmes and inputs to benefit women. However, not many voluntary agencies seem to have been able to devote their efforts towards designing more appropriate and effective programmes based on the knowledge, attitudes and perceptions of women, nor have they succeeded in devising or adapting technologies to suit the women's needs. There are considerable gaps in this direction and research is required to bridge them.

In order to better understand these gaps and to generate discussions on research perceptives to suit the lives of rural women, a workshop was jointly organised by BCT and IDRC. This workshop addressed itself to discussing the analysing activities and problems faced by Voluntary Agencies engaged at the grass-root level. It also provided a forum for individuals from Universities and Research Labs to share their perceptions and expertise.

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Since science and technology issues concerning the lives of rural women cover too wide a spectrum to be tackled in a single meeting, the workshop focused specifically on three themes:

E N E R G Y

P O S T P R O D U C T I O N

N U T R I T I O N A N D H E A L T H

The workshop attempted to review/overview the existing state of developmental activities as they directly or indirectly touch the lives of rural women. In each of the three selected areas an overview paper was presented followed by one or two case studies. The group was small enough to facilitate free exchange of ideas yet diverse enough to represent a wide range of experience and ideologies.

Through out, the following issues were focussed on.

1. Deficiencies in the existing innovations and systems.

2. Identification of gaps for further innovations.

3. Analysis of the technology transfer processes.

4. Assessment of research needs with reference to available or future innovations.

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5. Analysis of the requirements of the support systems such as - training in operation, maintenance and user feedback, financial viability in real terms, motivation for local enterpreneurial development in production, sales and service.

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II. PARTICIPANTS ::

Due to exigencies of the Gulf Crisis and the subsequent transportation breakdown, a large number of delegates had to miss attending the workshop at the last minute. Though small, the final group was composed of a balanced cross-section of attitudes and experience and it was agreed that the intimate size and informality of the sessions made for a comfortable and productive working environment.

The participants include :

- Sri P. Venkata Ramana,
- Tata Energy Research Institute, New Delhi.

- Smt. Gita Dendukuri,
  Andhra Pradesh Agricultural University,
  College of Home Science, HYDERABAD.

- Dr. V. Vimala,
  Andhra Pradesh Agricultural University,
  College of Home Science, HYDERABAD.

- Sri G. Munniraj,
  RHWS-A Department of Christian Medical College & Hospital, VELLORE.

- Sri Subash Mendhar Purkar,
  SUTRA, Himachal Pradesh.

- Dr. G. Subbulakshmi,
  Department of Food Science and Nutrition, SNDT Womens University, BOMBAY.

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- Dr. B.V. Parameswara Rao,
  B.C.T., YELLAMANCHILI - A.P.

- Dr. Ing. S. Satyamurthy,
  Eicher, New Delhi.

- Sri Ch. Rambabu,
  Grama Vikasa Samstha,
  Chittor District, Andhra Pradesh.

- Dr. K.R.K. Rao,
  B.C.T., YELLAMANCHILI, A.P.

- Mrs. D. Narayanamma,
  Mahila Mandal President,
  VELPUKONDAPALEM, Andhra Pradesh.

- Sri R. Adinarayana Rao,
  Indian Additives Ltd., MADRAS.

- Mrs. Asha Nori,
  Associate Editor,
  B.C.T. News, VISAKHAPATNAM.

R E S O U R C E P E R S O N S :

Sri M. Ramakrishnayya, IAS (Retd.)

Former Chairman, NABBARD,
&
PRESIDENT, B.C.T.

Prof. B. Sarveswararao,

EMERITUS PROFESSOR,
ANDHRA UNIVERSITY.

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III. S E S S I O N S :

29TH JANUARY, 1991.

After a brief welcoming address by B.C.T. President, Sri M. Ramakrishnayya, Dr.B.V. Parameswara Rao gave the assembled participants an overview of B.C.T's various projects and work to date with rural women. He underscored the women's own projects and their ability to handle everything themselves. He noted that for every one idea we give to the village women they give us ten in return. He elaborated B.C.T's multi-pronged approach and its emphasis on awareness building and literacy as a people's movement. He reminded the participants that there are umpteen technologies in the lab but that the bottle-neck is in exposing the rural folk to the available technologies. We must work from the villager's viewpoint. We must emphasise technologies from the people, as against the technologies imposed upon them.

He went on to note that NGO's only work in their own small pockets of influence and the villagers have survived in spite of us. We have not looked at a women's life in an integrated manner, observed her life from dawn to dusk and found out her thinking on what technology can do for her. If we touch a woman's life we touch the whole family. We need to find out what is indigenously avilable and what needs to be more deeply looked into the mode available. We are anxious to bring in technology but in our anxiety to implement we neglect the villagers desires and perspectives, he said.

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He welcomed the people assembled from grass root NGO's, Universities and Research Labs and urged them to explore the possible technological interventions into the lives of rural women, to discuss what has and has not been tried and to explore the process of technology transfer. He spoke about IDRC and its desire to draw out research perspectives. He thanked IDRC, in absentia, for helping to make the workshop possible and felt confident that it would help develop ways and means for further interactions with voluntary agencies.

Finally, the participants introduced themselves and briefly described their work to date.

NOTE: At all Six working Sessions the general moderator was Dr. Satyamurty, a human resource management expert and an appropriate technologist himself. The role of provocateur or devil's advocate was assumed by Sri Subash Mendhapurkar and the proceedings recorded by Anna Goldstein, B.C.T.

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S E S S I O N - I : E N E R G Y :

Sri Ramakrishnayya got the first session rolling with a rapid five litany of questions and considerations for the participants to bear in mind: What do rural women need? How best to implement these needs? What about regional differences? Local values, beliefs, customs and social situations must be kept in mind. We need research that integrates the technical and the social. We must consider all the aspects of women's lives; her domestic activities, her work in agriculture and animal husbandry.

Prof. B. Sarveswara Rao cautioned the group not to forget human energy while talking about maximum energy and alternative energy. He said women's drudgery and the elimination there of should be our top priority. He suggested taking a total view of family life and considering local fuel situations.

At this point Dr. Satyamurty asked the group to put forth their expectations for the workshop. Subash Manderpurkar raised a number of improtant issues he wanted addressed. Where are all these technologies leading? Do they empower women? Do they help women achieve control of body, mind and soul? Do they perpetuate traditional roles? Many technologies further marginalise women Who is the technology enriching and at whose expense? Does the technology generate surplus? Who gets it?

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Dr. Subbulakshmi requested a consideration of indigenous or traditional technologies blended with modern. She also hoped to gain an understanding of B.C.T's efforts with women and technologies. Sri R.A. Rao asked if we could create a specific extension plan for different levels of households. Dr. Vimala wanted to address possible application areas for both high and low tech interventions. Mrs. Geeta wondered how do we intervene in the transfer of technologies and what are the mechanisms for monitoring and feedback.

Others elaborated on these expectations and added, who decides what is "appropriate"? How can we better involve women in shaping their own destinies?

Venkataramana then gave a summary of his paper, "Rural Energy and Women, an Overview" which triggered much discussion and debate. Suggestions were put forth towards propagating backyard fuelwood gardens and energy plantations; very small portable biogas plants and compressed fuel bricks. While discussing energy plantations the concept of "common land" was put up and quickly discarded. In reality, said Dr. Parameswara Rao, there are no common lands existing.

Among the injustices rampant in this society, the 'invisible' nature of women's work was discussed. How, regardless of the nature, difficulty or importance of the work, if it is traditionally, women's work it is low status work. Women are able to produce more than they consume too. But this strength is turned against them and not only is the life span of women getting lower but the actual number of women is decreasing.

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Research needs to be conducted into the scale of projects, it was suggested. Are individuals, families, small groups or whole communities to be tapped? For different interventions, different scales are more effective. The possibilities of cooperative action were discussed, and the role of men brought into the debate--a man cannot make a chula but if a project becomes an income generating activity, unless properly implemented and monitored, it too is taken over from the women by the men.

It was declared that NGO's can do technical research and that successful initiatives must be worked out from the beginning in the field. The people must have a stake in the project and in the process the women must be empowered to perpetuate the technology and guide their own lives.

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S E S S I O N - II : E N E R G Y :

This session consisted of the audio-visual presentation of Gita Dendukuri's papers on "The Household Energy Senario in Semi-arid villages of Andhra Pradesh - Case studies of two Regions" and "Field Performance of Improved Chulhas in two villages of Telangana" liberally interspersed with questions and commentary. Gita's papers provided a wealth of general and specific information and she deftly and good naturedly fielded the near-constant interruptions of the eager group.

Among the important points brought out were the many benefits to women of such a technology as smokeless chulas, only one of which is increased fuel efficiency. Just as important are the lessened drudgery of cleaning blackened kitchens and pots, the obvious health benefits of decreased smoke inhalation and the reduced cooking time. It was also suggested by Sri Subash Mendapurkar that in his experience women previously removed from the scene by necessity during smoky cooking could now listen to the men talking and therefore haved increased information and interaction.

Technology always needs "after sales service" and the group felt it was important not to neglect this aspect of any intervention. The women should be selected by the community and appropriately trained. Ofcourse, a fee would be charged for services rendered and the women would subsequently have extra income. Chula technology is not new to the villagers, and it was clearly stated by Dr.Vimal that existing technologies are much more suc sful starting points for innovations. Alien technologies are most always failures. T voluntary agencies can take scientific odifications if the villagers are involved i esign and implementation processes.

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On going action research was felt to be the most effective method for helping people discov -er and elucidate their own needs, improve their situation, best utilise external interventions and choose the pace of improvement. There must be an integration of technologies and people.

The group recommended better documentation of failures as well as successes, increased inrteraction of the village women at all stages, improved methodologies for transfer of technology and continuous assessment of the situation. They also stressed the need for better inventories of the sites, with each situation acknowledged as unique.

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30TH JANUARY, 1991 :

S E S S I O N - I : POST PRODUCTIION :

The group began by brain-storming some general points of departure; the analysis of area specific technologies, the necessity for improving both home and farm technologies, the need for research into qualitative aspects of existing technologies, questions of transport and distribution of surplus and the importance of respecting the people's ways.

Dr. V. Vimala presented her paper on "Sorghum Food Enterprises for Development of Women and Children in the Rural Sector". Her research was into technologies to reduce the drudgery of women while providing nutritional, social and economic uplift. The project provided employment as well as helped foster leadership and management skills and communication techniques. She also stressed the desire for the process to be labour intensive, an important consideration for any rural women's development project.

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S E S S I O N - II : POST PRODUCTION :

This session began with some further discussion into the role of Voluntary Agencies. It was felt that NGO's should help clarify the perspectives and objectives of research. NGO's are best situated to help frame the problem and then locate the institutions who could best help with the technology source. The NGO has to work with the people through the whole process.

At this point Dr. L.S. Saraswathi's paper "Post Production Technologies and Women - an Overview" was read to the group. Dr. Saraswathi was unfortunately unable to come at the last moment but her thoughtful paper provoked much discussion. Amongst the topics brought out were the social and economic disparities between men and women and the subsequent unequal acess to information and innovations.

Ergometric considerations were discussed and it was felt that women should be designing for women. This was just one way in which the needs of rural women are ignored. Again the lack of sufficient and appropriate transfer materials and methods focusing on rural women was underscored.

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31ST JANUARY, 1991.

S E S S I O N - I : NUTRITION AND HEALTH:

Dr. G. Subbulakshmi got the Nutrition Session rolling with the presentation of her experiences as elaborated in her paper " " She detailed her personal experiences as well as provided some larger models. One chart detailed many factors contributing to the adoption of improved technologies which was relevant for all the sessions. She also has one paradigm for the breakdown of rural development programmes which listed production oriented programmes, consumption oriented programes and organisational linkages.

The discussions touched on better utilizing 'women specific' foods and locally available foods. Here NGO's are in a good position to identify the women best suited for training to develop entrepreunerial skills; women who could then sell say, enriched pickles or pappads, and provide a nutritional service as well as generate income. The role of children in disseminating information was discussed as important in popularising any intervention. Basically, it was felt that local practices and taboos ahead to be thoroughly explored and then certain behaiours emphasised or de-emphasised accordingly. The process of nutrition education and methods of national and local dissemination need to be more fully developed. NGO's were deemed to be well suited to motivate women to use the existing infra-structure and to increase communication and awareness.

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S E S S I O N - II : NUTRITION AND HEALTH

In this final topic session, the group decided to focus specifically on water, as women are the primary fetchers and carriers of water and water borne diseases remain endemic in the villages of India. It was seen that as the Government has little political will to implement effective programmes once again the onus of responsibility falls on the voluntary agencies to do research into traditional methods of harvesting, conservation and sourcing technologies. Here Smt. Narayanamma, from a local village elucidated the role of NGO's in empowering the women to confront the authorities "Before BCT came we never would have approached the Mandal" she said. Villagers do not always have the luxury of seeing their own lives in the terms of outsiders and here the NGO's can broaden perspectives so that the people can see alternative solutions to their own problems.

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F I E L D V I S I T S :

In addition to the six working sessions, the participants also took time to visit some relevant BCT sites. On the afternoon of the 29th the group travelled to Marripalem, a BCT village about 16 km. away. There, they had an opportunity to visit some homes and meet some Mahila Mandal members. As most of the participants spoke Telugu, the maximum benefit of the interaction was realised. It was a living example of the strengths of village women. The group was impressed by the articulate women and their stories which vividly illustrated the principle of empowerment. Integrated rural development, had brought these particular village women out from under the shadow of purdah into the light ~~of~~ of literacy,

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decision making and self-reliance.

The final day afforded some participants an opportunity to visit Panchadarla one of BCT's 4 demonstration farms, and see BCT's work in Wasteland Management and working models of some of the interventions, like biogas and bio-int ensive gardening, they had all been discussing. BCT's farms are living laboratories for on going action research in various agro-technologies and training centres for skills for villagers ranging from paravetrinarian to electrical engineers. A few participants also availed themselves of the opportunity to visit the 'School for Skills' in Yellamanchili where the craft of Etikoppaka toy making has been revived and provides hitherto unopened vistas for women's skilled work. Women are also being trained in tape weaving and now electronics.

On the evenings of the 29th and 30th, local talent was high-lighted in cultural performances under the stars. The first night's performance was kicked off by a spirited literacy street play performed by some of the youngsters from Dimili High School. Then a group of men from Gorledharmavaram Village performed the fast paced stick-clicking Kolatam song and dance. On the second evening a very professional group of amatuers from near by Venkatapurm Village impressed with their Tappetadugullu performance, tin-drums strapped to their chests and bells about their waists.

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IV. C O N C L U S I O N S :

As a result of the discussions, the following recommendations have been put forward for adoption by Voluntary Agencies, Researchers and Universities.

A. C O M M O N T H E M E S :

I. Rural Women must be the starting point, focus and constant reference point for all technological interventions into their lives.

II. An integrated, holistic, inter disciplinary approach need be taken towards all research. Research and subsequent interventions; if they are to be meaningful, should address a woman's whole day/year/life.

III. More research is necessary to explore which inrtervention processes will best enable the sustenance of woman's control of her activities while decreasing her drudgery.

IV. More Research into the transfer mechanisms of technology from lab to village, the most effective processes of intervention deployment, monitoring and documentation.

V. Both activiists and rural women involved in technology transfer should be sensitive to gender issues.

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VI. Focus should be put on traditional, existing technologies as entry points for innovations.

VII. Frequent interaction is needed among Universities, Research Institutes and Voluntary Agencies in identifying the scope of interventions and assessing more accurately the women's felt and undeclared needs.

VIII. As successful initiatives should be site-specific, the influence of Voluntary Agencies is critical and their role is crucial.

IX. Interventions must consider context, group dynamics and social orderings. Checks and balances should be instituted to prevent vested interests from usurping power or control.

X. More attention should be paid to ergometric considerations in the design, developement and implementation processes.

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B. S P E C I F I C T O P I C S :

E N E R G Y :

As there is excessive dependence on non-commercial energy sources especially fuel-wood which is not adequately or efficiently fulfilling the needs of women, research should be conducted to --

I. Improve local resources and perpetuate a self-reliant, environmentally sound fuel policy.

II. Create area specific inventories of energy resources and consumption patterns.

III. Provide better management of local forest resources.

IV. Find alternative packaging of energy sources.

V. Develop more appropriate integrated energy systems.

VI. Stimulate creative action research in alternative energy sources such as bio-mass, bio-gas, solar, wind, hydro energies and ~~xmoxxelxsx~~ other technicalities like smokeless chulas.

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C. POST PRODUCTION :

The participants felt that there was need to -

I. Identify areas, based on user declared needs, where drudgery is inhibiting optimum utilization, e.g. under-utilised food stuffs such as Sorghum.

II. Prepare an inventory of traditional technologies.

III. Step up documentation and inter-agency communication.

IV. Formulate action research into untapped potentials of storage, processing, preservation and other post-production technologies.

V. Experiment with integrating traditional and modern technologies to increase efficiency, cost-effectiveness and ultilization.

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D. N U T R I T I O N AND H E A L T H :

As nutritional deficiencies are basic and well documented, the group recommends -

I. Focus put on using established food practices to propagate nutritional fortification as well as introducing new ideas such as bio-intensive gardening.

II. More research done into effective information transfer, eg. children have been successfully utilised in the dissemination of nutritional information.

III. More on going specific research into possible areas of nutritional enrichment like High Calorie - High Density Foods.

The group recognises WATER as most pressing concern and recommends -

I. Research into traditional harvesting techniques, purification technologies and maximum utilisation of local resources and energy devides.

II. Increased research into issues of sanitation, eg. personal hygiene habits, community level interventions, desires for individual sanitation and waste water management.

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V. PARTICIPANTS' REACTIONS :

On the final day of the workshop the participants were asked to comment on the format, content, successes and failures of the preceding sessions. Some of their opinions and suggestions follow -

- The oral deliberations were useful. The recommendations are moderate, reasonable, achievable.

- Should have been more issue based .....More village women should have been invited here. .....We need to look more closely into political issues of technological interventions. .....Workshop made me reflect more on my own role in interventions. .....Met interesting people, enjoyed dialogues.

- Thought I'd learn more technologies. .....we need help in implementing more activities....as an NGO, I feel we can do effective research.....good to meet people from other disciplines.

- The problem has been working and thinking in isolation..... .....
A woman is one component of a family, a home and a community....Interested in the holistic approach, it's good for all people interested in rural development with women in mind.....I'm happy with the recommendations.

- Other workshoops - "too academic", here discussions were very informal and indepth.....moderated very well.....

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Involvement of a rural woman in the workshop was very good, we can take that home with us.....We definitely want to collaborate more and more with NGOs.

- Good that the list of invitees was sent early.....selected people whose own experience can contribute ..... larger groups miss a lot; appreciated that it was at Haripuram Farm.....First thing we should have done was go into the villages.....let's look at what women and men can do together.....good to observe B.C.T's activities.

- There is a lot of information out there....hopefully we have begun to network and started creatively interacting amongst NGO's, Universities and Research Institutes to best utilise our resources and improve the lives of rural women.

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A P P E N D I X - I

PAPERS ON ENERGY

OVERVIEW - ENERGY

VENKATA RAMANA

TATA ENERGY RESEARCH INSTITUTE

NEW DELHI

PRESENTED AT

BCT - IDRC WORKSHOP

"TECHNOLOGICAL INTERVENTIONS INTO THE LIVES OF RURAL WOMEN - RESEARCH PERSPECTIVES OF VOLUNTARY AGENCIES"

JAN 29 -31,'91.

RURAL ENERGY AND WOMEN

VENKATA RAMANA P.

TATA ENERGY RESEARCH INSTITUTE, NEW DELHI
JANUARY 1991

RURAL ENERGY AND WOMEN

Introduction

Energy for rural areas had not been an issue prior to 1970s, possibly because fuelwood was available in abundance from India's vast forest reserves. Only after the 'oil shock' and the realisation of the growing peril of deforestation in the mid-70s, did it attract the attention of policy makers as well as researchers in the developing world. In India, a major proportion of rural energy is contributed by fuelwood and depletion of forests due to a variety of reasons has made it scarce in several parts of the country. One of the major victims of the energy crisis is women who in most cases collect the fuel for their families. Promotion of renewable energy technologies was seen to be a major alternative to meet the fuel shortages and the decade of '80s witnessed a surfeit of technology dissemination programmes. However, the performance of these programmes has been mixed and the impact, if any, uncertain. The present paper attempts to examine the nature of the energy crisis and then review some of the energy programmes disseminated in the country.

Energy Consumption Patterns

There have been several macro and micro level studies conducted in various parts of the country which have recorded the consumption patterns, both in terms of quantities and the fuel-mix. One major conclusion of these studies was that the issue of rural energy was essentially an issue of fuelwood as the energy source and cooking as the end-use. For, 89 per cent of the total energy in rural areas comes from biomass fuels (wood, dung and crop wastes) (Natarajan, 1985). Further, 75 per cent of the total energy goes into domestic sector while 90 per cent of the domestic energy is for cooking. Among commercial fuels, only kerosene is

used to some extent, principally for lighting. Out of the energy contributed by the biomass fuels, wood alone accounts for 52 per cent (Figure 1). Interestingly, in states where there has been considerable deforestation, the consumption of other non-commercial fuels is high (Table 1). For instance, 41 per cent of the rural energy in Bihar, 27 per cent in Madhya Pradesh, 23.4 per cent in Orissa and 32,4 per cent in Uttar Pradesh was contributed by dung. And agriculturally-prosperous states like Punjab, Haryana and West Bengal, which have little forest, use more of agricultural residues. Thus, non-commercial fuels clearly dominate the energy-mix with wood as the leading fuel. And since the cooking is the primary activity in the rural energy sector, the energy crisis directly affects the women.

Rural Energy Crisis

As mentioned earlier, several parts of the country are experiencing energy crisis on account of depletion of forests. It has been estimated that India's forests are getting denuded at an alarming rate of nearly one million hectares per year. At present, the annual fuelwood consumption has been estimated at 162 million tonnes (World Bank, 1990). Some other estimates put the figure at as much as 300 million tonnes (CSE, 1985). On the other hand, the annual sustainable yield for fuelwood (the amount of wood that is permissible to be cut to allow the trees to grow at a natural rate of regeneration) is estimated to be only 42 million tonnes. This suggests that the deficit of 120 million tonnes is obviously being met through illegal fellings.

What are the causes for deforestation? It has often been argued that the fuelwood demand is the primary source of deforestation. However, several studies, both at macro and micro levels, pointed out that people use mostly twigs and branches for their fuel needs and do not cut trees (Natarajan, 1985). It can be seen in Table

1 that logs are prominently used as fuel only in the forest-rich Himachal Pradesh and North-east. On other hand, it has been well established that forest-clearing for commercial (industries, mines) and agricultural purposes was the main reason for depletion (CSE, 1985). Big projects like multi-purpose dams, road building, etc., also cause denudation to some extent.

But in recent years, another increasingly growing phenomenon has been the monetization of fuelwood exacerbating the energy crisis. As fuelwood became scarce, it began to be sold in the market and since it presented a source of income for people who live in an increasingly subsistence economy, lot of people took it up as a regular profession in non-agricultural season. This led to an increase in illegal felling by people who often risk even punishment. The CSE report estimated that there are at least 3-4 million people in the country who are dependent on fuelwood trade for their livelihood. Bina Agarwal reported that "In certain parts of Bihar, women of poor tribal households travel 8-10 km in search of firewood, then catch a train to the nearby town (Ranchi), spend the night at the station, and return with a meagre earning of Rs 5.50, on an average, for a headload of 20 kg of wood." (Agarwal, 1987) It is reported that in Jabalpur city alone, some 11000 headloads (110-165 tonnes) of fuelwood comes into the market every day (TERI, 1990). This monetization is further reducing the forests. On the other hand, grazing pressure and low energy inputs into agriculture in many regions is increasing the proportion of wastelands in the country. Thus, the entire biomass system, in which the grazing lands, forest lands and agricultural lands support each other, is being adversely affected.

Another indication of the growing crisis is the pattern of distribution of the agricultural residues. In the past, these used to be given away free to the labourers but now with increasing fuel problems, in many places they are given in lieu of part wages.

Impact on Women's Lives

It is ironical that even though local firewood demand is not the primary reason for energy crisis, the local people, especially women, are the worst affected. It is estimated that as much as 87 per cent of the wood consumed is collected and almost entirely by women and children (World Bank, 1990). With the forests receding farther, women have to travel longer distances at more frequent intervals than in the past. This cuts into the time devoted to household chores, and in many places, productive activities. Table 2 shows the amount of time and distance women have to travel in different parts of the country. It also shows the situation being particularly worse in the hill regions. For instance, in the Garhwal Himalayas, where due to migration of men, women often take up the chief responsibility of maintaining the family including cultivation, women are reported to spend as much as 11 hours per day in productive activities and energy crisis places additional strain on them (Singh and Singh, 1986).

However, as Bina Agarwal argues, given the traditional family systems in India, women would not get compensated for their extra work burden in increased food intake. Thus, fuel crisis has negative nutritional consequences for women. Also where the fuel scarcity is acute, women tend to use inferior fuels (bushes, weeds, roots, etc). For example, in Roli, a tribal village in Sabarkanta district of Gujarat, the situation is so desperate that "even a small weed on the road is collected. Women spend long hours trying to dig roots of trees cut long ago" (Nagabrahmam and Sambrani, 1983). Due to the use of inferior fuels, the per capita energy consumption for cooking goes down affecting the amount of food that can be cooked that influences the calorific value of the food one consumes. Presently in India, the per capita consumption of useful energy is in the range of 230-330 kCal per day as against a desirable 680 kCal (ABE, 1985).

Thus, in many areas, the crisis is assuming serious proportions. It is estimated that by the year 2000, the annual demand for fuelwood and dung will be nearly 300 million tonnes and 200 million tonnes respectively (assuming no energy plantations and biogas plants). With the chances of providing rural areas with fossil fuels being very low given the low purchasing power of majority people, it requires great efforts to meet such a massive demand.

Solutions to Energy Crisis

Promotion of renewable energy technologies and afforestation through wastelands development are two of the major recommendations put forward by various energy policy committees appointed by the government. Among the renewable energy programmes, the National Project for Biogas Development (NPBD) and the National Programme on Improved Chulhas (NPIC) are the most prominent (Figure 2) and are directly relevant for women as both cater mainly to the cooking needs and hence are reviewed here in some detail.

National Project for Biogas Development

Even though biogas plants were propagated as early as in 1974, the programme did not off until the Department of Non-conventional Energy Sources (DNES) took over the NPBD launched by the Ministry of Agriculture in 1981-82. DNES adopted a multi-agency-multi-model approach and the programme has steadily grown since then. By 1989-90, more than 1.3 million family size biogas plants were installed in the country (Figure 3) which are claimed to save about 4.38 million tonnes of wood valued at Rs 175 crores per year and another Rs 175 crores in the form of enriched manure generated by the plants (DNES, 1990).

However, several micro-level studies which attempted to evaluate the programme suggested that the success may not be so unequivocal and the biogas programme

suffered from several shortcomings (ORG; IHM, 1987; IIM, 1986). Firstly, since the programme was target-oriented (fulfilling the targets preset at the national level), other aspects of the programme were neglected. For instance, inadequate training to the masons led to poor quality of construction resulting in plant failures. Lack of user education has also been seen to have contributed to unsatisfactory performance. Realising some of the deficiencies, DNES started some rectification programmes which have yielded some positive results since then.

But even at a full success rate, biogas technology has some inherent limitations. For instance, it cannot perform well under cold conditions and also in water-scarce regions whereas it is usually these regions which need the energy most. Secondly, excessive dependence on cowdung as the feedstock has led to a situation where only those well-off families with sufficient amount of cattle could own biogas plants while the poor who really need biogas plants could not afford them even at the subsidy rate offered by the government. Above all, the 1.3 million plants installed so far represent only about one per cent of the total number of households in the rural areas and it will be long before they could make an impact on the energy scene. And for that, massive investments will be required (DNES envisages an investment of Rs 10,000 crores by 2000).

National Programme on Improved Chulhas

Improved chulha is essentially an improvised version of the traditional stove used in villages which has better heat transfer and smoke control mechanisms that result in a less wood-consuming, smokeless cooking operation. DNES launched its National Project for Demonstration of Improved Chulhas in December 1983 which became NPIC after 15 months. DNES adopted a similar strategy like biogas wherein different stove designs are approved to be disseminated by several governmental and non-governmental organizations according to the set targets. So far, nearly 8

million stoves have been set up in the country (Figure 4) supposedly saving wood worth of Rs 224 annually.

However, NPIC has been found to be more problem-prone than even NPBD. Firstly, several studies report high failure rate and indicate inadequate training, poor quality construction as the reasons, though DNES denied these studies (Sarin, 1986a; Upadhyay, 1987; Tilak and Hanbar, 1987; Pundit et al, 1987). Also in absence of user education, women tended to alter stove designs on their own resulting in more fuel being consumed instead of less. Also as the experience in several Asian, African and Latin American countries showed, dovetailing the stove designs to the local food habits, types of fuels used, types of vessels used, etc., is most crucial for the success of the programme (Foley et al, 1984). That is, stove is essentially a location-specific, need-specific device and unless the women who use it are actively involved in its design and dissemination process, chance of success will be low. This was also proved by some Indian programmes in which when women were involved, like in Nada chulha in Haryana, they enjoyed better success (Sarin, 1986b).

Conclusions

Though considerable efforts and investments were made in both the programmes, the results that have been available so far have not inspired confidence that they could be the panacea to the rural energy crisis. Though, evaluation studies have still to be conducted on a major scale before any definitive opinion is formed about the success or failure of these programmes, it is pretty clear that a lot needs to be done.

From a technological point of view, both biogas and improved chulhas are ideal for a predominantly biomass-based country like India. But if they have to suc-

ceed, major changes have to be brought about in the dissemination strategy.

a) Firstly, more emphasis has to be put on a need-specific research and development (R&D) in both the technologies. For instance, in biogas, research can be concentrated on developing alternative feedstocks, like water hyacinth and human waste, so that even non-cattleholding families can own biogas plants. Then, microbiological experiments like developing bacteria that can ferment at low temperatures and with less water content should be undertaken. If technological breakthroughs are achieved in this respect, biogas can become the "fuel of the future".

   In the case of improved stoves also, it is necessary to develop designs that suit the local conditions and practices by taking into account the characteristics peculiar to different regions.

b) Secondly, a far greater emphasis should be placed on training which can improve the quality of the systems dramatically. Involving women at every stage of the design can be a great help in this regard.

c) User education is crucial so special efforts should be made to develop consumer awareness.

d) Reliable feedback mechanisms should be developed so that ground level information on the performance is available to the decision makers who can then set their target on a more rational basis.

DNES has initiated several activities in the right direction, but these have to be expedited so that the benefits can reach the people in the short run. Then only will it be possible to meet the ever-growing energy crisis in a sustainable manner.

Table 1: RURAL ENERGY CONSUMPTION PATTERN

STATE	KERO SENE	TOTAL COMME-RCIAL	LOGS	TWIGS	CHAR COAL	CROP WASTE	DUNG	TOTAL NON-COMME-RCIAL
A.P.	8.7	10.2	22.4	48.1	0.2	10.4	8.4	89.5
ASSAM	9.7	10.5	45.0	24.4	0	20.1	0	89.5
BIHAR	3.7	7.8	4.3	26.9	0	19.9	41.1	92.2
GUJARAT	26.3	32.7	14.6	39.6	0.1	2.7	14.7	66.7
HARYANA	4.2	9.4	5.6	13.8	0	27.3	43.9	90.6
H.P.	7.4	12.1	44.0	44.1	0	0.1	0.7	88.9
J & K	5.9	9.7	23.6	39.0	1.8	3.0	22.9	90.3
KARNA	6.5	9.3	22.7	51.3	0	14.7	1.6	90.3
KERALA	7.2	10.9	17.3	42.3	0	29.5	0	89.1
M.P.	4.1	4.8	26.2	29.8	0.2	12.3	26.8	95.3
MAHA	14.6	19.5	33.6	28.4	0.1	4.3	13.7	80.1
MEGHA	6.1	6.7	63.7	14.0	0.1	15.5	0	93.3
ORISSA	3.6	5.7	15.3	45.9	0.1	9.6	23.4	87.2
PUNJAB	6.9	12.8	9.6	17.8	0	31.1	28.7	96.2
RAJA	2.8	3.7	22.8	47.7	0	4.0	21.7	87.2
T.N.	9.2	12.7	26.9	39.5	0	13.4	7.4	96.2
U.P.	3.6	4.6	0	35.0	0	19.0	32.4	87.2
W.B.	7.0	21.4	6.6	17.8	0.7	38.9	14.6	86.4
DELHI	4.6	43.4	14.6	13.5	0	13.6	14.7	78.6
INDIA	7.1	10.8	17.6	33.9	0.1	16.3	21.1	89.0

Source: Natarajan, 1985

Table 2: TIME AND DISTANCE TRAVELLED BY WOMEN

Place	Time spent	Distance travelled	Year of Study
CHAMOLI (Hills)			
(a) DWing	5 hrs per day	) 5 km	1982
(b) Pakhi	4 hrs per day	) 3 km	1982
GUJARAT (plains)			
(a) Forested	once in 4 days	--	1980
(b) Depleted	once in 2 days	4-5 km	1980
(c) Severely depleted	4-5 hrs a day	--	1980
M.P. (Plains)	twice a week	5 km	1980
KUMAON (Hills)	thrice a week	5-7 km	1982
KARNATAKA (Plains)	thrice a week	5.4 km/trip	
GARHWAL (Hills)	5 hrs per day	10 km	

Source: Agarwal (1986)

ENERGY CONSUMPTION PATTERN
(% share of fuels)

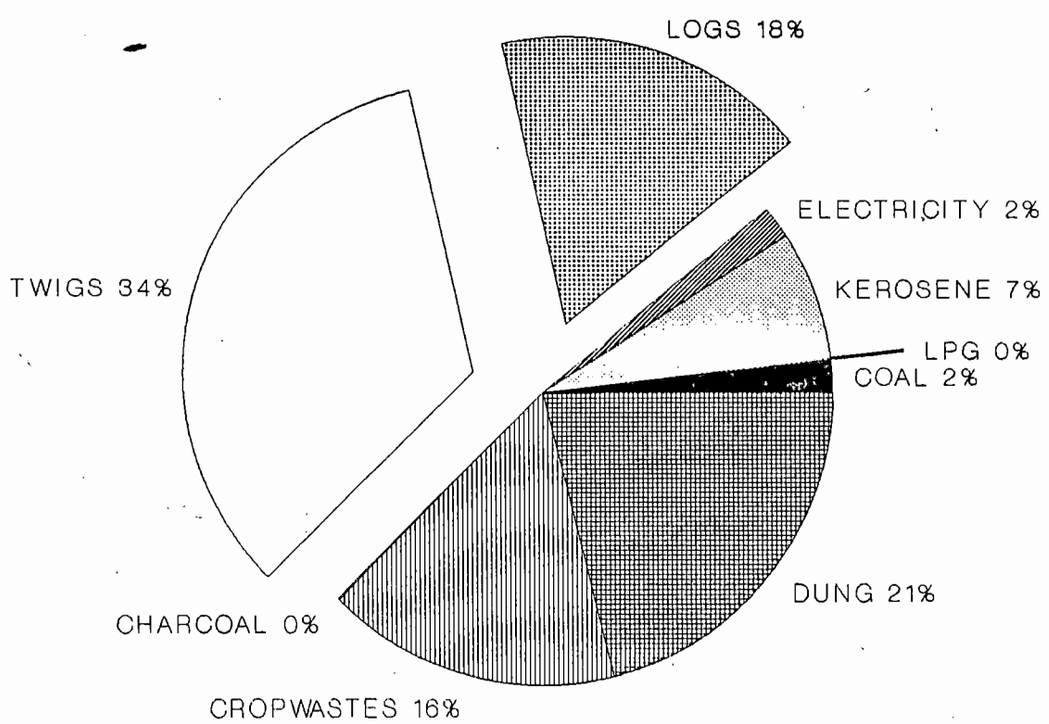

Figure 1

DNES BUDGETARY ALLOCATIONS
1989-90

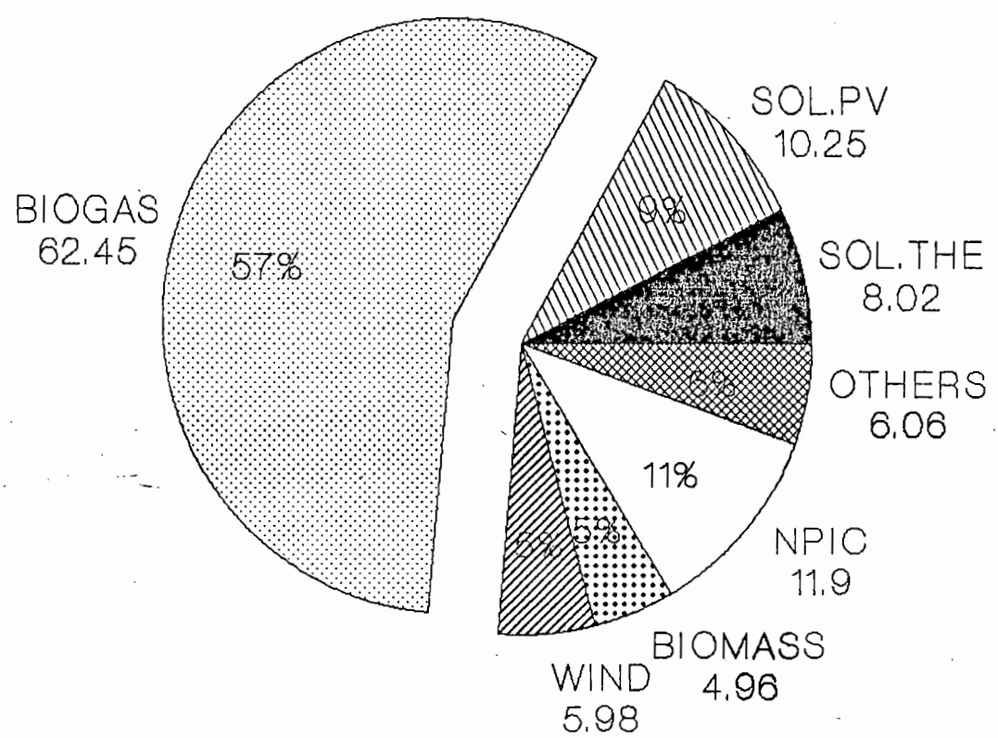

Figure 2

Figures In Rs. Crores

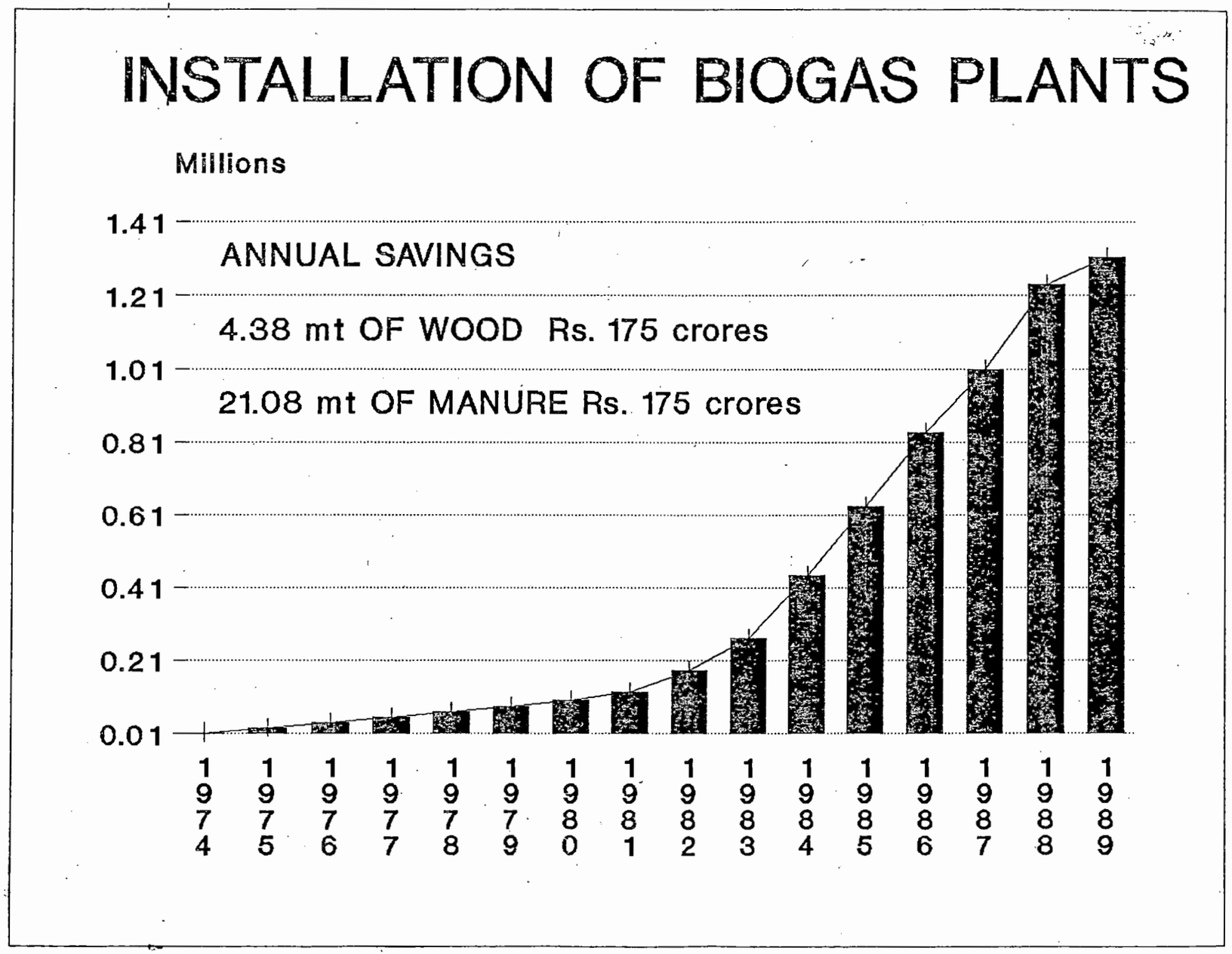
INSTALLATION OF BIOGAS PLANTS
Millions
1.41
1.21
1.01
0.81
0.61
0.41
0.21
0.01
ANNUAL SAVINGS
4.38 mt OF WOOD Rs. 175 crores
21.08 mt OF MANURE Rs. 175 crores
1974
1975
1976
1977
1978
1979
1980
1981
1982
1983
1984
1985
1986
1987
1988
1989

Figure 3

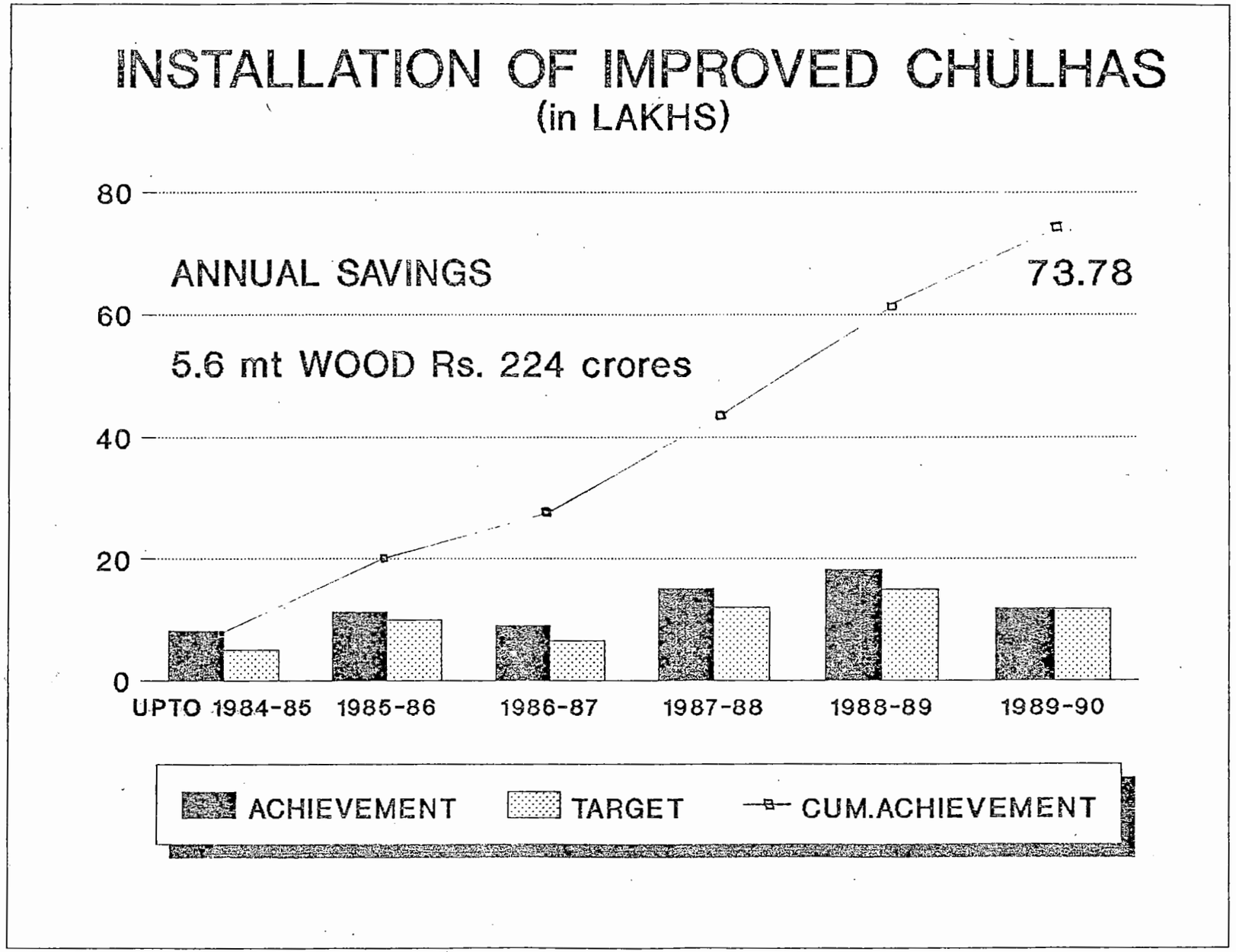
INSTALLATION OF IMPROVED CHULHAS
(in LAKHS)
80
60
40
20
0
ANNUAL SAVINGS
73.78
5.6 mt WOOD Rs. 224 crores
UPTO 1984-85
1985-86
1986-87
1987-88
1988-89
1989-90
ACHIEVEMENT
TARGET
CUM.ACHIEVEMENT

Figure 4

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CASE STUDY - ENERGY

GITA DUNDUKURI

COLLEGE OF HOMESCIENCE

A.P. AGRICULTURAL UNIVERSITY

HYDERABAD

PRESENTED AT

BCT - IDRC WORKSHOP

"TECHNOLOGICAL ADVANCES INTO THE LIVES OF RURAL WOMEN - RESEARCH PERSPECTIVES OF VOLUNTARY AGENCIES"

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THE HOUSEHOLD ENERGY SCENARIO IN SEMI-ARID VILLAGES OF ANDHRA PRADESH - CASE STUDIES OF TWO REGIONS.

GITA DENDUKURI*

ABSTRACT

The determination of future energy requirements of Indian rural areas necessitates establishment of a reliable information base on biomass energy utilisation patterns of specific regions. In semi-arid regions where availability of biomass fuels from plant and animal sources is relatively low, utilisation patterns are influenced considerably by a multitude of variables. In particular, fuel wood consumption levels for cooking can be as low as 1.00 tonne per household of 5 members against the national average of 2.40 tonnes. Low availability of fuelwood leads to substitution by animal dung and crop residues which have vital alternate uses of replenishing soil nutrients. On the other hand high availability of fuel wood results in indiscriminate use. Shortage in supply of fuel for cooking may necessitate compromises in food consumption levels and diminish human work productivity. Intra-village as well as inter-village variations emphasise the need for planning renewable energy programmes on the basis of local resource availability and requirements.

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*Assistant Research Scientist, ICAR Coordinated Project on Energy Requirements in Agricultural Sector, College of Home Science, A.P.Agricultural University, Hyderabad.

THE HOUSEHOLD ENERGY SCENARIO IN SEMI-ARID VILLAGES OF ANDHRA PRADESH

GITA DENDUKURI*

INTRODUCTION

The wide spread concern over energy shortages in Indian rural areas during the last two decades can be attributed to two important factors, namely -

- rapid dwindling of forest lands which provide firewood, a major non-commercial fuel
- low availability of commercial energy resources such as electricity and petroleum products.

In millions of homes across the country the subsistence energy needs of cooking and heating are met from traditional resources including firewood, crop residues and animal dung. Energy used for cooking accounts for about 80 per cent of the total rural energy consumption. Further, most of this energy is secured by the physical efforts of women and children and is used at low levels of efficiency, usually less than 10 per cent.

Climate, cropping systems, local resource availability and cultural practices have an important influence on energy supply and demand. The present case study examines energy utilisation patterns in two dry semi arid villages of Andhra Pradesh where average annual rainfall is less than 750 mm. These areas are

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* Assistant Research Scientist, ICAR Coordinated Project on Energy Requirements in Agricultural Sector, College of Home Science, A.P.Agricultural University, Hyderabad.

characterised by poor soil fertility and low biomass productivity Rainfed natural vegetation has low annual increments, which are inadequate to meet the mounting fuel and timber needs of the local communities.

Methodology Census surveys of energy consumption were conducted in two villages of Telangana and Rayalaseema respectively. Energy used from different sources for household activities was determined in terms of physical units.

-- litres of kerosene oil, kwh of electricity, kilograms of firewood, hours of human labour. These were converted into common energy units, namely, megajoules MJ to study energy availability and use within the village eco-system and for making inter-source comparisons.

Findings

GENERAL INFORMATION

Topography of the villages

Mogullavampu, a hamlet of Yacharam village is situated 55 km. south-east of Hyderabad, in Ranga Reddy District. The principal crops grown are sorghum, castor, pearl millet, rice and pigeon pea. About 95 per cent of land area is under rain fed cultivation. The village is about 1.5 km interior from the state highway and residents frequently commute to Yacharam for day-to-day needs such as rations, groceries and grain mills. The only institutions within the village are an anganwadi and a primary school. About 35 per cent households are electrified.

Water for domestic use is obtained from bore wells (2 out of 5 bore wells were dry at the time of survey). Firewood is semi-commercial in this village as it is located about 8 km from the nearest forest area, and common property resources are negligible.

Krishnamareddi Palli, a hamlet of Kandukuru village, is situated 16 km south of Anantapur town. The village is 3 km interior from N.H.7 and has very limited infra-structure facilities. The principal crops are goundnut, pigeon pea and pearl millet. Farmers owning irrigated land have mulberrry and sweet lime orchards. Next to groundnuts, seri culture and horticulture are important sources of income in this area. About 44 per cent households are electriffied. Domestic water supply is obtained from borewells and agricultural wells (5 out of 6 borewells were dry at the time of survey). Kerosene and castor oil are used for lighting. The predominant cooking fuels are thorny twigs of Prosopis juliflora, which grows wild in the vicinity of the village. Dry branches of mulberry and sweet lime trees and pigeon pea stalks are also widely used.

Population:

Table 1 shows the farm category-wise distribution of population in the two villages.

Landless households accounted for 25 and 34 per cent of the households in Mogullavampu and K.R. Palli respectively. Extremes of economic status were more evident in K.R.Palli, where medium

farmers constituted only 7.6 per cent of the total village population. The average family size was 5.4 in both villages. The maximum family sizes of 6.5 and 7.9 were observed in the large farmer category, while the smallest family size of less than 5 members was noticed in marginal farm households.

Kitchens and Cooking Devices

The typical cooking device used in this region consists of a fixed model traditional chulha made of mud. The average dimensions are 1.0 x 0.35 x 0.2 m. It has 2 pot seats and 2 horse shoe shaped combustion chambers. The normal practice is to use only one pot seat, usually the one on the right. The earthen pot embedded at the extreme right of this stove is a local innovation for heating water simultaneously while cooking. The capacity of this pot can range from 10 to 25 litres, although 12 and 15 litre pots are most common. Generally, combinations of traditional fuels are used such as wood and dung, or wood and crop residue.

In both the villages, a majority of families cooked indoors. Typical kitchens in K.R. Palli had elaborate smoke outlets in the form of hoods over the cooking area. Table 2 gives details of the cooking devices used. The local traditional chulha used at K.R. Palli was similar in design to that in Telangana, but larger in size to accomodate locally available fuels which were mostly twigs and crops residues. The cooking area was white washed freqeuntly. Bajra and ragi flour were cooked in combination with rice.

Fuel Procurement Practices

The sources of fuel and the manner of procurement are given in Table 3. Common property resources, particularly prosopis trees were a major fuel source in K.R.Palli. Frequency of fuel gathering was also more often in this village when compared to Mogullavampu.

ENERGY UTILISATION PATTERNS

Human Energy

Time spent by women on household work indicated striking similarities in the two villages (Table 4). The maximum time was spent on cooking in all categories (2 to 4 hours), followed by cleaning and collecting water (about 2 hours each). Collecting fuel, a periodic activity, was more time-consuming in lower economic groups.

Commercial Energy

Annual electric consumption per electrified household was 242.3 kWh at Mogullavampu and 183.65 kWh at K.R.Palli. These averages are higher then the A.P.State average of 160.07 kWh and the All India average of 167.30 kWh (APSEB, 1985). These statistics do not reveal the fact that less than 50 per cent households in these villages are electrified, and that electricity is used almost exclusively for lighting. Well-to-do farmers in K.R.Palli have fans, radios and television sets.

Kerosene consumption averaged to 2.5 to 3.0 litres per month and was used sparingly for igniting fires, since it was needed for lighting in many households.

Non-Commercial Energy

The significant features of non-commercial fuel use (Table 5) were as follows.

The use of firewood as fuel increased with farm size in both regions. Animal dung was not used as fuel by any category in the Rayalaseema village. Dung was collected in compost pits and used primarily for manure. However use of residues was higher than in Telangana. Greater proportions of residues were used by landless labourers and marginal farmers.

ENERGY CONSUMPTION OF HOUSEHOLDS

Influencing Factors

Income, farm size and family size were found to be significant determinants of household energy consumption from firewood, electricity and castor oil. F-ratios indicated that the first two variables had a greater influence than family size. This may be attributed to economy of scale with increase in household members. Table 6, brings out the influence of farm size on energy use. From a study of energy flows in five villages of Andhra Pradesh, Pachauri and Rao stated that the low influence of family size on energy consumption necessitates close observations of cooking practices which could have important policy implications (Pachauri and Govinda Rao, 1981).

A comparison of per capita energy consumption for cooking in different village studies, reveals interesting results (Appendix). The energy used for cooking in jowar-eating areas ranges from 5.19 to 8.74 GJ per capita in different villages, and is two to three times the energy used in rice-eating villages, which is 1.13 to 3.69 GJ per capita per year.

Total Energy Consumption

A comparison of source-wise energy use of households in the two regions studied shows that 75 to 78 per cent of energy is obtained from non-commercial fuels and only to 6 to 8 per cent is from commercial sources. Human energy provides 15 to 17 per cent and is the second most important energy resource of the household (Table 7).

In absolute terms energy consumption averaged to 32 GJ per annum in the Telangana village and 44 GJ in the Rayalaseema village. The most significant difference was in the level of non-commercial energy use.

CONCLUSION

Energy planners and policy makers should take into consideration the needs and priorities of different regions and sociological settings within a state. The above case study and others like it, underscore the importance of assessment of household energy needs in rural areas. The following conclusions can be drawn.

- There is a need for establishment of a firm information base on household energy use patterns of different agro-climatic regions, particularly with reference to availability and utilisation of non-commercial fuels.

- The influence of variables including cropping system, season, economic status and cultural factors should be highlighted in energy assessments of specific locations.

- For energy-intensive household uses particularly cooking, the level of non-commercial fuel use should be quantified on the basis of measurement.

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APPENDIX IV

ENERGY USE FOR DOMESTIC COOKING IN SELECTED RICE AND MILLET EATING AREAS

State/ Region	Village	Energy used for cooking (traditional energy & kerosene) GJ per capita per year	Source
Rice and Bajra eating areas			
Rayalaseema A.P	Gunnikuntla	2.79	Bowonder, et al,1988
	Doolavaripalle	2.43	
	Pemmadapalle	3.45	
Coastal Andhra A.P	Lankapalle	2.99	Pachauri & Govinda Rao,1981
	Chinnkallepalle	1.13	
	Bhavadevarapalle	2.50	
Telangana A.P	Padkal	3.71	
	Ahmednagar	3.69	
Wheat and Jowar Eating areas			
M.P	Islamnagar	8.56	Maheshwari et al 1981
Maharashtra	Jageshwari	7.21	Bowonder et al 1988
	Satwad	5.28	
Telangana	Gopularam	6.37	
	Chandanagar	6.29	
	Reddypalle	6.92	
	Thukkuguda	8.74	FAIR (Foundation to aid industrial recovery, Hyd)
	Gunegal	8.65	AICRP-ERAS, APAU 1984
	Mogullavampu	5.19*	AICRP-ERAS, APAU 1987

*Adapted from Bowonder, et al 1981
*Village in which performance evaluation of improved chulhas was conducted

Table 1 Demographic details of Mogullavampu and K.R.Palli

Farm category	Mogullavampu			K.R.Palli		
	No. of households	Population	Average family size	No. of households	Population	Average family size
Marginal < 1 ha	21 (16.4)	97 (14.0)	4.62	43 (20.3)	190 (16.5)	4.41
Small 1-2 ha	26 (20.3)	145 (21.0)	5.58	42 (19.8)	222 (19.3)	5.28
Medium 2-4 ha	26 (20.3)	137 (19.8)	5.27	16 (7.6)	98 (8.5)	6.12
Large > 4 ha	23 (18.0)	149 (21.6)	6.48	38 (17.9)	300 (26.1)	7.89
Landless	32 (25.0)	163 (23.6)	5.09	73 (34.4)	340 (29.6)	4.66
Total	128 (100.0)	691 (100.0)	5.40	212 (100.0)	1150 (100.0)	5.42

Table 2 Cooking devices used at Mogullavampu and K.R.Palli.

Type of device	Mogullavampu No.	K.R.Palli No.
Three stone device	26	69
Local traditional *chulha* - stone/mud	97	175
Pottery clay *chulha*		
Fixed	13	-
Portable	12	5
Saw dust *chulha*	3	-
Kerosene wick stove	2	-
Electric stove	2	1
Biogas plant (8 m^3)	-	2
Smokeless *chulha* (fixed)		
Self-built	-	5
Government built		
Retained	-	10
Removed	-	23

Table 3 Fuel sources and procurement practices at Mogullavampu and K.R.Palli

	Mogullavampu % households	K.R.Palli % households
Fuel Source		
Own	46.9	22.6
Common	15.6	54.2
Forest	43.8	27.8
Purchased	28.9	---
Frequency of gathering		
Weekly	35.2	48.1
Fortnightly	10.2	25.9
Monthly	---	22.7
2 or 3 times/year	10.2	3.3
Yearly	28.9	---

Table 4 Time utilisation patterns of women for household activities at Mogullavampu and K.R.Palli

(hr/household/day)

Household activity	Mogullavampu					K.R.Palli				
	Marginal	Small	Medium	Large	Landless	Marginal	Small	Medium	Large	Landless
Food preparation	2.19	2.67	3.46	4.16	2.46	2.28	2.64	2.94	4.05	2.79
Collecting water	1.40	1.44	1.78	2.47	1.20	0.91	1.38	1.48	0.74	1.16
Collecting/ preparing fuel	0.71	0.37	0.34	0.41	0.71	0.79	0.43	0.40	0.24	1.86
Cleaning (house, utensils, clothes, provisions)	1.62	2.29	2.32	2.56	1.84	1.90	1.95	2.23	2.98	2.23
Child care	1.42	1.02	1.65	1.36	1.17	1.30	1.52	2.19	2.39	1.54
Marketing	0.05	0.07	0.03	0.03	0.11	0.22	0.04	0.11	0.08	0.11
Total Women	7.39	7.86	9.58	10.99	7.49	7.40	7.96	9.35	10.48	9.69
time Men	0.33	0.65	0.34	0.33	0.71	1.85	1.71	1.82	2.68	1.62
spent Children	0.72	0.71	0.92	0.43	0.81	1.33	0.95	0.60	0.30	0.59
Grand Total	8.44	9.22	10.84	11.75	9.01	10.58	10.62	11.77	13.46	11.90

Table 5 Non-commercial energy consumption at Mogullavampu and K.R.Palli

(kg/household/annum)

Farm	Telangana Village			Rayalaseema Village		
	Firewood	Dung cakes	Crop residues	Firewood	Dung cakes	Crop residues
Marginal	996	123	205	426	not used	1231
Small	1074	116	198	1293	not used	811
Medium	1131	315	155	1397	not used	976
Large	1398	416	120	2458	not used	868
Landless	956	48	238	729	not used	1214
Average	1101	213	187	1152	not used	1058

Table 6 : Farm size, income and household energy consumption at K.R.Palli

Farm size (ha)	Gross annual income (Rs/ household)	Energy consumption (MJ/household/year)			
		Commercial	Non-commercial	Human	Total
Marginal (< 1)	8091	2017 (6.5)	23057 (74.1)	6041 (19.4)	31115 (100.0)
Small (1-2)	12110	2512 (6.0)	33405 (79.5)	6120 (14.5)	42037 (100.0)
Medium (2-4)	12534	2756 (5.9)	37344 (79.5)	6874 (14.6)	46974 (100.0)
Large (> 4)	62195	4848 (7.1)	55090 (81.1)	8026 (11.8)	67964 (100.0)
Landless	7339	2213	28303	6923	37439
Average	18662	2746 (6.3)	33906 (78.1)	6779 (15.6)	43431 (100.0)

Figures in parentheses are percentages.

Table 7 Source-wise energy consumption of rural households in two regions of Andhra Pradesh

(/ household / annum)

Energy Source	Telangana village N = 128 households			Rayalaseema village N = 212 households		
	Units	Energy value MJ	% of total energy	Units	Energy value MJ	% of total energy
Commercial Energy						
Kerosene (litre)	36	1488	4.6	30.9	127	2.9
Castor oil (kg)	-	-	-	14.6	49	1.2
Efectricity (kWh)	85	1016	3.2	81.4	971	2.2
		2504	7.8		2745	6.3
Non-commercial Energy						
Firewood (kg)	1101	19818	61.8	1152	20736	47.7
Crop/tree residues (kg)	187	2337	7.3	1058	13225	30.4
Animal dung (kg)	213	1866	5.8	not used	00.0	0 0.0
		24021	74.9		33961	78.1
Human Energy						
Man (hr)	180	353	1.1	688	1349	3.1
Woman (hr)	3148	4942	15.4	3285	5157	11.9
Child (hr)	267	262	0.8	278	272	0.6
		5557	17.3		6779	15.6
GRAND TOTAL		32082	100.0		43485	100.0

CASE STUDY - ENERGY

GITA DUNDUKURI

COLLEGE OF HOMESCIENCE

A.P. AGRICULTURAL UNIVERSITY

HYDERABAD

PRESENTED AT

BCT - IDRC WORKSHOP

"TECHNOLOGICAL ADVANCES INTO THE LIVES OF RURAL WOMEN - RESEARCH PERSPECTIVES OF VOLUNTARY AGENCIES"

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FIELD PERFORMANCE OF IMPROVED CHULHAS IN TWO VILLAGES OF TELANGANA

GITA DENDUKURI*

ABSTRACT

The development and large scale dissemination of improved chulhas is one of the major steps taken by the Government of India to conserve fuelwood resources in the country. t The design and testing of this household technology, solves only one aspect of the problem of fuel wood shortages. Bringing about consumer acceptance by satisfying the user, is the more difficult aspect. Bridging the gap between innovation and adoption is a formidable task and necessitates thorough understanding of the technology on the one hand, and the local situation where it is introduced, on the other. In particular, the overall efficiency of chulhas is influenced by several factors even under similar operating conditions. Hence, dissemination programmes should necessarily be followed by periodic monitoring and follow-up action with a special emphasis on maintenance, corrections and feed-back from the users.

INTRODUCTION

At the beginning of the VII plan period, the National Project on Improved Chulhas of the DNES (Dept. of Non-Conventional Energy Sources) proposed to introduce 50lakh improved chulhas (fuel-efficient cooking devices) in the country by 1990. It was estimated that the "net annual saving of fuelwood would be of the order of 42 lakh tonnes".[1]

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*Assistant Research Scientist, ICAR Coordinated Project on Energy Requirements in Agricultural Sector, College of Home Science, A.P.Agricultural University, Hyderabad.

Since the inception of this National Project in 1983, several improved Chulha models have been developed, which have high thermal efficiencies (25% and more) when compared to open fires and traditional shielded devices. Some of these models have gained wide acceptance in different parts of the country. Often, the associated benefits of smokeless, clean surroundings and convenience of cooking have overshodowed fuel economy. In a few instances, estimates of fuel saving have been reported as approximations based on local measures rather than on empirical evidences. During the first three years of the VII Plan, the following facts become clear from the feed-back received from different stages of the country[2]

- The majority of women either mis-used or removed the dampers provided with the Chulha, thus lowering its efficiency.
- Initial acceptance of the improved chulha dwindled to total dis-use after a period of time due to poor maintenance and lack of local skill for making repairs.

These findings led to the development of damper-less models.(Since 1987), the DNES has been recognizing only damper-less models). The concept of monitoring the use of the new Chulhas for a 1-year period has also been incorporated into the Improved Chulha programme since 1988-89.

The imminent need for large-scale fuelwood saving through efficient Chulhas has necessitated frequent policy changes based

on feed-back from users, highlighting the vital role of accurate feed-back information in this programme.

This paper sets forth field experiences in the monitoring and evaluation of improved chulhas in two Telangana Villages.

METHODOLOGY:

A fixed model improved chulha adapted to suit local cooking practices and fuels was introduced in 139 households at Gunegal and Mogullavampu, two villages in Ranga Reddy District. A portable model was distributed on a trial basis to 15 households in the latter village. The energy use patterns in these villages had already been determined by fuel weighment surveys.

The fixed improved chulha was made of locally available clay and rice husk (bricks were also used at Mogullavampu). It consisted of the following parts and accessories.

- two pot seats (dia ranging from 7" to 9")
- an asbestos cement chimney (ht 10' ; dia 3")
- a perforated mild steel grate and an ash pit below the combustion chamber
- a baffle wall below the second pot seat
- two asbestos/mild steel dampers to control the fire
- a ring-shaped vessel supporter made of tin to accommodate small sized vessels.

While constructing the chulhas, special attention was given to maintaining optimum inner dimensions and making them individual specific with regard to size of pot seat and

(contd.....4)

firebox entry. Kitchens were visited several times during construction of the chulhas and after, to instruct women and ensure correct and regular use of the new device. Problems faced were attended to. Evaluation surveys were conducted as follows:

i) A fuel consumption schedule was used to record daily consumption of wood, dung and farm/forest residues for a one-week period under similar seasonal conditions as in the survey conducted earlier.

ii) A user's evaluation schedule was used to elicit information on method of use, foods cooked, benefits and problems experienced (Appendix V).

At Gunegal village, a 'long-term' evaluation was carried out 18 to 24 months after construction and regular use. In this long term evaluation, special emphasis was laid on the present condition and maintenance problems encountered in regular use of the improved chulhas.

Weighment of fuel in households before and after introduction of the new device enabled comparisons of fuel consumption with the traditional and improved chulhas. The criteria adopted for field performance evaluation included the following:

- Extent of adoption (regularity of use)
- Method of use of both pot seats
- (in the case of fixed models)
- Physical condition of chulhas
- Fuel consumption
- Benefits and problems experienced by users.

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FINDINGS

FUEL CONSUMPTION

There was a decrease in the consumption of all the three forms of biomass fuel used (firewood, animal dung and residues) at Gunegal (Table 1). With the fixed chulha, the saving in firewood used for cooking was about 0.8 kg/household/day in both villages. Savings recorded in the case of dry dung and residues exceeded 80 percent at Gunegal. It was observed that with better air draft in the Improved Chulha, it was relatively easy to light a fire and keep it burning continuously. This reduced consumption of supplementary/aid fuels namely, dung and residues which emitted considerable smoke and soot. The overall saving of energy from all biomass sources was 18.1 and 19.5 per cent with fixed models in the two villages. Hard wood cut to suitable size was reported to be the most suitable fuel for ~~imrp~~ improved chulhas. The portable model recorded the highest saving of 27.7 percent.

METHOD OF USE

In 89 per cent of the households, the improved chulhas were in regular use for the entire cooking. The remaining 11 percent used alternative devices for part of the cooking (mainly for making of jowar roti) or when a single item such as rice was cooked.

An important advantage of well-designed multi-pot improved chulhas is that two or more items can be cooked from a single fire (Table 2).

The main pot seat was observed to be used for high-heat cooking operations, namely, to make jowar rotis, rice, dhal and vegetables. The utility of the second pot seat was well understood by 58 percent and 72 percent of the households who used it for high as well as low heat operations such as, heating water, making tea, cooking dhal and vegetables. The remaining households used it only for heating water. This implies good utilisation efficiency in addition to device efficiency.

The vessel support plate was reported to be a very useful accessory as it facilitated use of animal vessels of varying sizes.

EXTENT OF ADOPTION

A long-term evaluation conducted at Gunegal 24 months after introduction, showed that the improved chulhas were in regular use by 90 percent of the households. The condition of the chulhas after long-term use is summarised in Table 3.

In both evaluations it was found that the use of dampers was not fully understood by several women in spite of repeated explanation. In 30 per cent households the chimney damper was either broken or not inserted in its place. Further instruction is needed in the use of this important accessory as it directly influence fuel consumption.

PHYSICAL CONDITION OF CHULHA

Maintenance and repairs: If improved chulhas are to bring about fuel savings to desired levels, their maintenance is an important consideration in evaluating long-term use. Regular mud-plastering of the exterior and interior surfaces and periodic cleaning of soot in the chimney, are the main maintenance requirements to ensure continued and effective use. Shaping of pot seat edges and fire box entry were the structural repairs that were periodically necessary. Tables 4 and 5 give details of these aspects.

BENEFITS AND PROBLEMS EXPERIENCED BY USERS

While the high level of acceptance was itself an indicator of benefits experienced, details of the felt benefits expressed over a time interval of 18 months are compared in Table 6.

It was found that the benefits of a smokeless had reduced because of inadequate maintenance (clogged chimneys) and incorrect use. Fuel saving continued to be experienced by 79 percent and time saving by 96 percent of the users. Problems faced are summarised in Table 7. In the case of the portable model, the problems faced by users were excessive soot formation on utensils, smoke emission and lack of a second pot seat.

Some observations volunteered by the users of fixed models were as follows:

- Leading fire box to maximum at the start of cooking enables working with minimum of attention to the fire
- Spherical bottomed vessels shorten cooking time
- Fanning is not required
- Less charcoal is formed
- Heat is more intense and steady
- Ash is useful in filling crevices and smoothening pot seat surfaces.

As a follow-up of the two evaluations conducted at Gunegal village, the pot seats were reinforced with mild steal rings of suitable diameters in all the households.

CONCLUSIONS AND RECOMMENDATIONS

In the specific instance of fixed improved chulhas, models developed should take into consideration the design of preferred local devices and prevailing cooking practices of a region.

(i) In regions where cooking directly over fire is not practiced, the size of fire-box entry may be reduced from the usually recommended 175 mm x 200 mm (of recognised models) to smaller sizes. This would eliminate the necessity for a front damper

arrangement which is unsuited for mud structures and not fully understood by women. The chimney or outlet damper which has a greater influence on efficiency, may be retained.

(ii) Where feasible, a perforated grate may be introduced in the combustion chamber to improve overall efficiency and stove performance.

(iii) Stove size must be suited to quantity of cooking and average duration of use per meal. Vessel surface exposed to heat and insertion depth of vessels in the pot seats should be given utmost consideration during construction. Fixed model chulhas which permit flexibility during construction and use should be given preference.

(iv) Utilisation efficiency should be maximised by improved extension efforts towards

- correct use of chimney damper
- cleaning of flue channel and chimney
- effective use of both pot seats for a variety of cooking processes from simmering to frying.

(v) All components of Improved Chulhas - chimneys, grates, dampers, chimney covers, and vessel support plates - should be able to withstand intense heat and rough use for atleast three years.

- The implementation of improved chulha programmes in an area or village, should necessarily be preceded by a pilot introduction in a representative sample of at least 20 households. Performance evaluation should be based upon (i) extent of adoption (ii) method of use and (iii) comparison of fuel consumption patterns before and after introduction of the new device.

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Table 1. Comparison of daily fuel use patterns before and after introduction of fixed model improved *chulhas* in two villages

Type of fuel	Unit	GUNEGAL Before (A)	GUNEGAL After (B)	GUNEGAL Difference (B-A)	MOGULLAVAMPU Before (A)	MOGULLAVAMPU After (B)	MOGULLAVAMPU Difference (B-A)
Fixed model							
Firewood	kg	8.05	7.26	(-)0.79	3.53	2.72	(-)0.81
Dry dung	kg	0.41	0.08	(-)0.33	0.71	0.39	(-)0.32
Crop/tree residues	kg	1.12	0.14	(-)0.98	0.13	0.41	(+)0.28
Total energy value	MJ	162.49	133.13	(-)29.36 (-)18.07	71.39	57.44	(-)13.95 (-) 19.54%
Portable model					89.04	64.34	(-)24.70 (-)27.7%

Savings in firewood at Gunegal

With fixed model 29 MJ = 1.61 kg/day
= 588 kg/year

Savings in firewood at Mogullavampu

With fixed model 14 MJ = 0.778 kg/day
= 284 kg/year

With portable model 25 MJ = 1.389 kg/day
= 507 kg/year

Table 2 : Method of use of improved *chulhas* in two villages

(per cent households)

Items cooked/heated	Mogullavampu	Gunegal
Main pot seat		
Jowar roti, rice, *dhal*, vegetable, snacks	100	89
All foods except *jowar roti*	-	11
Second pot seat		
Dhal/vegetable, milk, tea, water	58	51
Milk, tea, water	-	21
Water only	42	28

Table 3 : Physical condition of improved *chulha* after 24 months of use at Gunegal village

(percent households)

Part of *chula*	Condition		
	Satis-factory	In need of slight repair	In need of major repair/ replacement
Mud structure			
Exterior surface	79	14	7
Main pot seat	37	39	24
Second pot seat	49	42	9
Combustion chamber	60	28	12
Baffle wall	65	30	5
Ash pit	91	5	4
Fire box entry	65	19	16
Accessories			
Grate	100	--	0
Vessel support plate	58	--	42
Front damper	33	--	67
Chimney damper	70	--	30
Chimney	100	--	0
Chimney cover	77	--	23

N = 57

Table 4 Maintenance practices of users of improved *chulhas*

(per cent households)

Frequency	Mud plastering		Cleaning of chimney
	Exterior	Interior	
Never	--	--	30
Daily	65	23	--
Twice/thrice weekly	28	26	--
Weekly	5	37	--
Fortnightly	2	14	--
Monthly/Bi-monthly	--	--	12
Once/twice yearly	--	--	58

N = 57

Table 5 Structural repairs performed by users

(percent households)

Nature of repair	Performed by
Shaping of pot seat edges	56
Reinforcing pot seat edges with steel	7
Shaping of fire box entry/roof	36
Narrowing combustion chamber	7
Fixing grate	5
Removing grate and sealing ash pit	4
Replacing chimney cover	2
Sealing crack in chimney pipe	2

N = 57

Table 6 : Benefits reported after short-term and long-term use of improved *chulhas* at Gunegal village.

(percent households)

Benefit	Positive responses	
	Short-term evaluation N = 50	Long-term evaluation N = 57
Smokeless work area	100	74
Reduced soot on vessels	100	93
Cleanliness of surroundings	94	74
Saving of fuel	80	79
Saving of time	76	96

Table 7 : Problems faced with improved *chulhas*

(percent households)

Problem	Experienced by
Pot seat edges worn out or too small	23
Fire box entry worn out	7
Unsuitable for small scale cooking	7
Unsuitable for making *jowar rotis*	11
Unsuitable for large vessels	5

N = 57

APPENDIX 1

Pre-requisites for introduction of improved chulhas

1. Enlisting types of fuel used locally, their sources and availability in different seasons.

2. Studying design and performance of typical local cooking devices.

3. Studying local meal pattern and cooking practices.

4. Quantifying existing levels of energy use in different socio-economic groups for traditional as well as commercial energy resources through well designed sample surveys.

5. Determining extent of commercilisation of traditional fuels and their prevailing prices.

6. Selection and pilot introduction of 2 or 3 appropriate improved chulha models to suit different family sizes and cooking requirements.

7. Training of local artisans to build the stoves at site and carry out repairs.

8. Involving extension personnel who are familiar with domestic cooking requirements and practices, for monitoring and evalnating the performance of the new devices.

APPENDIX I

Pre-requisites for introduction of improved chulhas

1. Enlisting types of fuel used locally, their sources and availability in different seasons.

2. Studying design and performance of typical local cooking devices.

3. Studying local meal pattern and cooking practices.

4. Quantifying existing levels of energy use in different socio-economic groups for traditional as well as commercial energy resources through well designed sample surveys.

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6. Selection and pilot introduction of 2 or 3 appropriate improved chulha models to suit different family sizes and cooking requirements.

7. Training of local artisans to build the stoves at site and carry out repairs.

8. Involving extension personnel who are familiar with domestic cooking requirements and practices, for monitoring and evalnating the performance of the new devices.

A P P E N D I X - II

PAPERS ON POST-PRODUCTION

POST PRODUCTION - OVERVIEW

DR. L.S. SARASWATHI

MADRAS

PRESENTED AT

BCT - IDRC WORKSHOP

"TECHNOLOGICAL INTERVENTIONS IN THE LIVES OF RURAL WOMEN - RESEARCH PERSPECTIVES OF VOLUNTARY AGENCIES"

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POST PRODUCTION TECHNOLOGY AND WOMEN: AN OVERVIEW

L. S. Saraswathi

Introduction:

The present paper is an overview of the existing scene of post production or post harvest technologies and women. It is planned to present a brief description of the scene in general, role of women in post harvest operations and problems of women in gaining access and control over improved technologies. The presentation is not exhaustive. It is meant to stimulate comments and elicit further information.

Magnitude of post harvest operations:

The variety and the quantity of grains produced in the country indicate the magnitude of post harvest work in general. The quantity of grains retained by the farmer for his own consumption and for seed show the magnitude of the task at the farm and home level and also theextent of the role of women. The level of technology employed for the operations indicate further the intensity of the labour involved or otherwise.

The principal grains produced in India are rice, wheat, jowar, maize, bajra, ragi, barley, small millets and pulse varieties. A total of 170.63 million metric tonnes of food grains has been produced in 1989-90. The production is expected to increase upto 240 million metric tonnes by 2000 A.D. It is estimated that about a third of the grains is marketed and two thirds is retained by the growers for their own consumption and for seeds. The level of technology available in the country for post harvest operations shows a move towards modernization. The level of technology predominantly used is the labour intensive traditional technology. The existing agriculture system, with its gender specific roles, show that the post harvest operations on the grains produced are mostly the responsibility of women with some help from men. This

is especially true with reference to the quantum of grains retained by the farm families, which is quite substantial.

Technologies in post harvest operations:

The post harvest operations are threshing, cleaning, grading, drying, storage and processing for consumption such as parboiling and milling (grain and flour milling). In this section while presenting the technologies, the roles of women or men are also specified.

Threshing: The harvested crops are threshed for separating the grains either manually or by using bullocks or mechanically by using threshers. Threshing is generally done by men with the women helping them in bundling the harvested crops and handing them for threshing. In some places it is done by women. As a large number of farmers are small and marginal farmers threshing is mostly done either manually or by the use of bullocks. Sometimes it is also done by spreading the crops on the road for the vehicles to tread on them.

Cleaning: Cleaning of food grains involves removal of as much of extraneous matter as possible. The traditional method employed for cleaning grains consists of passing the grain over a set of screens (sieves) and then subjecting it to oscillation on a bamboo plate. Cleaning by this process mainly effects shape separation and partial gravity separation. This operation is manual and is generally done by women. A single person can clean half a tonne per day. Hand-operated or power-operated machines are increasingly being introduced. These machines are generally operated by men. The traditional method is still the most predominant.

Grading: The grains are graded according to their quality.

The quality is determined by their characteristics in terms of differences in physical shape, in specific gravity, reflection or transmission of light, floatation, centrifugal force and elasticity. Mechanical and/or electrical devices for grading have been developed according to each of the characteristics listed. As it stands to-day, the grains are graded mainly by shape and gravity. This is done mostly by physically examining the grains. Mechanical and other devices are probably used in national and state level grain storage and distribution centres.

Drying: Moisture is an important constituent of grain. It is present in varying amounts in all the grains. With high moisture content, the grain is susceptible to deterioration. Insects attack and multiply, moulds grow and chemical changes in the grain occur with the increased moisture levels. Sun-drying is the technique that is followed in respect of large quantities of grains. Most grains are spread in the open exposed to the Sun for varying periods depending upon the initial moisture and intensity of heat. Floors used are either plastered with mud or cemented. One tonne of grain takes about 10 sq.m. of space. This operation is mostly done by women. other modes of drying are by using grain dryers with heated air, with unheated air and with chemicals. They are not used as much as sun drying.

Storage: Till the beginning of the present century large quantities of grains were stored in an underground facility. This changed over to storage in receptacles which are fabricated from materials locally available and are placed above ground. BISI has laid down standards for most commonly used receptacles. The traditional indoor and outdoor storage structures are made of straw, reeds, bamboo, wood or masonry, earthen-wares and Hessian structures of gunny bags. The grains and the seeds stored seem to suffer quantitative and

qualitative damages due to insect and rodent infestation (7.55% AND 2.50% respectively) and also mould attack (0.68%). Studies indicate loss of seed viability.

Structure is an important input in storage technology of agricultural commodities. An ideal storage structure is one which should protect the grains and/or the seeds from seasonal variations in temperatures and humidity, from insects, rodents, birds and moisture and also amenable for carrying out insect control measures. Efforts are being made to improve the traditional storage structures and also develop new ones to save every grain that is produced. The choice and use of these structures are made by both men and women. The choice depends upon their need and affordability. The women are engaged more in the use of storage structures than probably in their actual fabrication.

Insect infestation is one of the serious problems in agricultural commodity storage. The traditional methods to kill insects and to preserve grain are by using inert materials like paddy husk, ash, red earth, raw clay with the grain/seed material. Plant materials like leaves, seeds, flowers and roots of certain plants are mixed with the grain to prevent insect development. The common plant materials are neem, pyrethrum, anona, sweet flag kachura, arrowroot, derris. Vegetable oils are aslo being smeared on to the grains particularly pulses. However, none of the traditional methods have been found to give cent percent control or prevention. The limiting factors are the cost of treatment, the difficulty in application, development of ransidity and failure to control internal infestation. Research work carried out at the Central Food Technological Research Institute (CFTRI) have indicated several methods to control insect infestation. Activated clay (Kaolin) treatment and fumigants like ethylene di bromide can be used. The guidelines for using should be

strictly followed. Care of the stored grain is mainly the responsibility of women. Information about storage structures and insect control measures should reach women. Efforts for reaching women are few and far between as the approach to such work is generally family approach. In patriarchal families it is the men who are given importance.

Processing for consumption:

Wheat, the staple food in North India, produced or purchased immediately after harvest is cleaned at home, ground in a stone mill and the whole wheat flour produced is used for preparation of unleavened bread. Of the approximately 70% retained by the farmer 5-7% is kept as seed, 3-4% as cattle feed and the rest is used as human food.

Rice is produced and consumed much more than the wheat in India. Rice is consumed either par-boiled or raw. About 20% paddy is hand-pounded and the rest is milled. About 20-25% is par-boiled. About 5% of paddy is used as by-products of beaten rice, puffed rice, roasted rice etc.,

Other grains such as maize, jowar, bajra, ragi and other millets are processed through cleaning and grinding in stone mills and cooked as unleavened bread.

These processes of cleaning, hand-stone milling, small scale par-boiling, preparation of beaten rice etc., are carried out by women. Hand pounding of paddy and dehusking are again a woman's job.

Milling involves cleaning, husking, sorting, whitening, polishing, grinding and sifting. Milling are of two types: grain milling wherein the husk is removed retaining the original shape of the grain and flour milling wherein the

bran is removed from the grain to produce flour. Variety of machines are in use for husking/scouring/hulling. The grain and flour mills are in use for small as well as large quantity milling. These mills are mostly owned and operated by men. Hand pounding and stone milling are still the job of women.

Par-boiling is a hydrothermal treatment followed by drying before milling. There are three major steps in par-boiling: soaking, steaming and drying. Central Food Technological Research Institute has improved the mechanised par boiling technologies.

Pulse-milling : There are two methods in vogue: wet milling and dry milling. The latter is used mostly in commercial mills. There is no common processing method for all types of pulses. General operations involved are cleaning, pitting or rolling, pre-treatment with oil, conditioning, dehusking and splitting and polishing. In commercial mills every operation is mechanised and both women and men are involved at various stages. At the household level wet milling is commonly used by women. Pulses are cleaned, soaked in water, mixed with red earth, conditioned, dehusked and split and graded (split halves, broken and powder).

WOMEN AND POST HARVEST TECHNOLOGIES: SOME ANALYSES

In this section efforts are made to highlight some of the issues regarding women, their access and control over improved technologies. Some questions are being raised and some analyses are made.

- A clear picture that emerges is that the rural women carry out the post harvest operations on the grains produced using mostly labour intensive traditional technologies. Why not using improved technologies ?

Women are mainly family food producers and agricultural labourers. This determines their status in family and society. Social and economic status biases may be responsible for the picture that emerged. Women's access to innovations that could improve their situations is diminished as they lag behind men. Dominant groups can promote technologies that enhance their interests at the expense of the under-privileged.

If women were paid equally for their labour, the economic justification for certain technologies for female tasks would increase. In India lower wage rates for rural women are explained on grounds of differential productivity. Women work less than men as they often bring their children to work. As long as women accept lower rates of pay for equal work, they are denying their right to development technology. A husband or employer has little incentive to replace cheap, efficient and uncomplaining female labour with technology until it becomes a necessity.

- Men seem to take over those operations which are capital intensive and mechanised (e.g. hand pounding and milling). It appears that it is generally accepted that men are capable of handling machines more than women. Is it true ? Is it a question of attitude of men towards women ?

It has been shown that there is no biological predisposition to mechanical skills. Stuides show that when girls are not socialized against technology they can do as well or better than boys. Given the customary gender differences in both socialization and education and training, women will need additional training to become proficient in the application of high technology or improved technology for their work.

Studies have shown that non-productive/household level

technologies, meaning those technologies with no obvious financial returns are far more oriented towards women. Cooking and family planning are associated with women. Anything mechanical and business oriented is seen as being in male domain. This is reported to be true of the development projects promoting different kinds of technologies.

It is often cited in literature on women and technology that a vast majority of design engineers are men who do not take into account special design needs of women. Women are not smaller men. Their needs should be studied. For example, their work posture is different especially if they carry an infant on the back. In addition they use equipment around small children. Hence they are more concerned about safety. Designers should meet their potential clientele and get their inputs in designing any machine for them. Besides, the extension agents and sales agents of commercial companies selling technological innovations are men. A heavy male bias is in the technological centres and in both large and small firms manufacturing technological hardware.

o As the reality shows that rural women use mostly traditional technologies, can we say that women do not readily adopt new technology ?! If so WHY ?

In order to adopt a technology one must first know of its existence, understand its applicability and relevance, feel confident about its use and maintenance and be able to afford to buy and run it. Women have far less access to the necessary information than men. Rural women do not have any information about the improved technologies availble. Hence they cannot make informed choices or vocalize a demand. It is quite possible that such technologies are not commercially produced as there may not be a ready market for them. Even when they

have information about a new technology, it may not be according to their needs and hence inappropriate. This is mainly due to ignoring the needs of rural women and also the ideas they may have in improving the technology they are using. It is a question of attitudes of the designers and the extension workers towards the capability of rural women. It is still to be understood and internalized that people are not being developed when they are herded like animals into new ventures. The extension is not transference of techniques and knowledge but it is to provide women with productive opportunities and to enable women in the programme to make their own choices for their own development.

It is also possible women may not be able to adopt because of the money investments needed and their lack of access to cash or credit. This discriminates against the women and against the landless. They also have lesser access to technical and management training. This deprives them of possible business opportunities based on improved technologies.

The opportunities for access to information on new technologies are generally through the extension workers. The extension workers are generally overburdened as they are fewer in number than necessary and they are ill equipped to be effective. Women extension workers to reach women is a good idea. At present such workers seem to focus on women's domestic roles than on their productive roles in agriculture. They do not seem to help women to come into the mainstream. They need to be trained and equipped to see the role of women as it really is and not merely through the socio-cultural norms.

Other modes of communication channels such as radio and television are again less accessible to rural poor women

as they have less time to listen to and they cannot keep the radio with them as men do. Materials and methods aiming at rural women directly are almost nil. There is need to develop methods of approaching rural women to enable them discover themselves and in developing materials that they would find interesting and useful in improving their lives.

Few questions have been raised. Some analyses have been made. Many more questions can be raised and should be raised.

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CASE STUDY - POST PRODUCTION TECHNOLOGY

DR. V. VIMALA

COLLEGE OF HOME SCIENCE

A.P. AGRICULTURAL UNIVERSITY

HYDERABAD

PRESENTED AT

BCT - IDRC WORKSHOP

"TECHNOLOGICAL ADVANCES INTO THE LIVES OF
RURAL WOMEN - RESEARCH PERSPECTIVES OF
VOLUNTARY AGENCIES"

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SORGHUM FOOD ENTERPRISES FOR DEVELOPMENT OF WOMEN AND CHILDREN IN RURAL SECTOR

V.VIMALA*, P.GEERVANI AND KANWALJIT KAUR

The concept of sorghum food enterprises for economic development of rural women and nutritional improvement of preschool children in dryland region is an outcome of the operational research carried out in the last ten years at the College of Home Science, Andhra Pradesh. The first emphasis is on reducing drudgery of women involved in the use of millets and legumes. The second emphasis is on increasing the income of women, because women in dryland regions are under employed and their income is spent on acquiring food, medicine and clothing for the family specially children. The third emphasis is on development of millet and legume food enterprises.

As sorghum is produced more abundantly than other millets the choice was on sorghum and legume enterprise. The benefits of such an enterprise will increase the women's income and improve the nutritional status of children. Sorghum enterprises can be run by a single woman with the help of her family or it can be run as a group activity by a few women. Organisation of women into a group is an important initial step for running any income

* Associate Professor, IDRC Scheme, College of Home Science, A.P.Agricultural University, Hyderabad-500 004. India.

gensrating activity. Working as a group and the concept of group strength has to be understood by women. A successful experience of working together gives strength and confidence to the group to take on bigger issues in future.

Certain skills are required for women in operating an enterprise

- Skill in product development
- Organisational capabilities
- Leadership qualities
- Communication strategies
- Management capacities with regard to resources, finances, personnel, marketing etc.

Women should also be aware of existing financial facilities available under IRDP, Women's finance corporation and banks. For women in rural and semi urban sector two types of enterprises are considered possible with sorghum.

These are -

- Enterprises with products of primary processing eg. flour and rava.
- Enterprises with products of secondary processing

Products of primary processing namely flour and rava (semolina) could be used by the whole family. Rava could be used by creches for preparing upma and porridge for feeding children. Products of secondary processing like breakfast foods, snack items, baked

items etc. can be used for household purpose. These ready to eat foods (specially biscuits) can be used for ICDS and Balwadi feeding programme. It should provide 300 k.calories of energy and 8-9 g. of protein. The cost of the supplement should not exceed 45 paise. The shelf life of the product should be at least two months. They should be easy to pack. Keeping all these factors in mind sorghum enterprises have been developed.

Initiation of sorghum enterprises involved two phases namely (1) Preliminary phase and (2) Operational Phase

PRELIMINARY PHASE

- Situational analysis of market demand for sorghum and sorghum foods
- Situational analysis of supplementary foods for feeding programme in A.P.
- Product development
- Assessing of equipment required for the enterprises
- Developing strategies for promoting and sale of sorghum based foods.

OPERATIONAL PHASE

- Enumeration of government and non government organisations involved in women welfare and child development.
- Village level organisation and mobilization of women's group.
- Assisting the entrepreneur to establish food enterprise
- Monitoring the production unit

PRELIMINARY PHASE

SITUATIONAL ANALYSIS OF MARKET DEMAND FOR SORGHUM AND SORGHUM FOODS

Analysis of market demand for a food is very essential for the success of any food enterprise. Hence market research study on sorghum was conducted in colloboration with society for Development Alternatives, New Delhi with the following objectives. The study was to assess :

- the acceptance of sorghum in relation to other cereals
- the preference of consumers for sorghum by form, product, type, price.
- the beliefs, likes and dislikes of consumers
- the profile of users and non users.

The survey was done with help of structured questionnaire on households, millers, bakers and distributors.

Market research on sorghum threw light on the following aspects -

- technical work is necessary to develop a dehulling process that would increase shelf life of sorghum and make it easy to cook.
- Product development is needed on recipes suitable for special / festival occasions and also to make sorghum suitable for bakeries either in itself or as an additive to wheat.
- Communications are needed to reenforce sorghum nutritional values and to counter-act negative perception about sorghum.

- Marketing effort has to start with prospective consumers.
- The initial "core" group for enterprises would be those already using sorghum to whom the added value of recipes or varieties make some sense.
- Pursue fair price shops for distribution.

MARKET STUDY ON DEHULLED SORGHUM PRODUCTS

To test the market demand for dehulled sorghum products, three products namely - dehulled sorghum, flour and semolina were sold through three super bazaars for one year. A consumer card was inserted in each packet to get the opinion of the consumers. The demand for the different products was obtained.

An important suggestion of the respondents was that sorghum and its products should be available through fair price shops so that common man both in urban and rural areas has access to such products.

SITUATIONAL ANALYSIS OF SUPPLEMENTARY FOODS IN FEEDING PROGRAMMES IN ANDHRA PRADESH

One of the objectives of the project is to introduce sorghum supplementary foods in feeding programmes wherever it is feasible. It is essential to assess the opinion of the beneficiaries and staff before a new approach in supplementary feeding programme is initiated. Hence a study was planned to collect information from beneficiaries and staff of the project areas namely Balawadies run by RASS and supplementary feeding programme in urban ICDS, Hyderabad.

Type, amount and nutritive value of the supplements provided in existing feeding programmes is given in Table 1 and 2.

Table 1. Details of supplement given in Balwadies run by RASS

Particulars of supplement	Pre-schoolers	Pregnant and lactating mother
Type	Milk, Upma	Milk
Amount	Milk 100-125 ml Upma 50-75 g.	Milk 100-125 ml.
Nutritive value	—	Protein 6.4-9 g Kcal. 187-288

Table 2. Details of supplement given in ICDS, Hyderabad

Particulars of supplement	Infants	Pre-schoolers	Pregnant and lactating women
Type	RTE powder	RTE powder	RTE powder
Form in which consumed	Powder porridge	Laddu	Powder roti
Amount	85 g.	85 g.	135 g.

Majority of the beneficiaries wanted a change in the supplement. The type of supplementary foods suggested by the respondents is given in Table 3 and 4. Food products suggested by less than 5% of respondents were ignored.

Table 3. Supplementary foods suggested by the respondents for children (RASS)

Suggested food products	% of respondents
Biscuits	50
Eggs	44
Roti	8
Pongal	7
Fruits	5
Kesari	5
No idea	10

Table 4. Sorghum based supplementary foods suggested by respondents (%) for ICDS Programme

Foods	Category of beneficiaries		
	Infants	Pre-schoolers	Nursing mothers
Biscuits	43.2	42.4	38.6
Muruku	2.9	3.8	1.5
Roti	1.1	2.5	2.3
Miscellaneous	3.0	5.9	2.3
No idea	55.1	34.0	58.4

Though many foods were suggested preference was given for biscuits, eggs and milk by majority of respondents. The reasons given by both mother and child beneficiary for a change in supplement are -

- The supplement is not tasty
- Some times it is infested
- Monotonous
- It causes ailments like diarrhoea, stomach ache, vomitings and worms in stools.

PRODUCT DEVELOPMENT

With this encouraging survey results, the project staff started developing products suitable for profitable enterprises and supplementary feeding programme. Standardisation and development of products for food enterprise involved the following tasks.

- Standardisation on laboratory scale
- Evaluation by trained panel
- Standardisation and production on large scale
- Consumer evaluation
- Assessment of process time, cost and equipment
- Assessment of storage quality

Process was developed for the preparation of fine quality flour and rava (semolina). Among secondary processed products novel bakery items, delicious snack items and traditional breakfast items were standardised and developed. It is possibl

to prepare all these products by substituting 100% sorghum for rice flour, bengalgram flour / white flour. But incorporation of 20% rice flour / bengalgram flour / white flour improved the palatability characteristics remarkably. Standardisation of products with different type of equipment was done to suit the needs of both urban and rural sector. For example, biscuits were standardised and developed both in brick oven and electric oven.

ASSESSMENT OF EQUIPMENT REQUIRED FOR THE ENTERPRISE

Details of type, number and cost of equipment for production units of different size and different products were listed. Information on the availability of these equipment was also procured.

As an outcome of this task a project profile was developed with all details required for an entrepreneur.

DEVELOPING STRATEGIES FOR PROMOTION AND SALE OF SORGHUM BASED FOODS

Organizations differ in their objectives of promoting sorghum based enterprises. The size and type of enterprise to be taken up by each organisation differed. Some organizations took up snack foods while some took up only primary processed products (sale of sorghum flour and semolina). Some were interested in supplementary foods. Therefore depending upon the interests and ability of the organizations, suitable strategies were developed.

OPERATIONAL PHASE

ENUMERATION OF GO'S AND NGO's INVOLVED IN WOMEN WELFARE AND CHILD DEVELOPMENT

Contacts were developed with the help of department of women and child welfare, department of rural development and NGO's to get the names of organisations who are involved in promoting child development and women welfare. These contacts were made at different levels and in different situations through meetings, group discussions, visits etc. These discussions were held either at College of Home Science or at the field levels itself where NGO's and women groups function. Mobilizations and organizations of women's group at Village level was done through

- Personal contacts
- Group discussions
- Demonstrations cum exhibition
- Farmers day celebrations etc.

Rapport was established with the organisation interested in promoting sorghum food enterprises Table 5.

Assisting entrepreneurs to establish food enterprises Training Programme on Sorghum Food Enterprises was developed for each organisation individually. Training manual was developed. The training period and the content of the training varied with the type of enterprises to be taken up by the organisation.

Table 5. Organisations interested in sorghum food enterprises

Organisation	Location	Enterprise
Old age Welfare Centre (NGO)	Miapur R.R.District	Dehulling Unit
DWCRA Unit (IRDP - Dept. Panchayat Raj)	Prodatur Cuddapah District	Dehulling Unit
Subhadra Instant Foods (Family enterprise)	Hyderabad	Dehulling Unit
Mahila Mandal (Women's group)	Kurnool	Dehulling Unit
RASS (NGO)	Pichatur Chittoor District.	Bakery Unit
BGMS (NGO)	Hyderabad	Bakery Unit
Bala Mahila Pragathi Pranganam (Women Welfare Department Govt. of A.P.)	Chilakur (Mianabad District)	Bakery unit

Women selected by these organisations were either trained at field level or at College of Home Science. The research team trained the women in primary processing of sorghum, preparations of sorghum baked foods, snack items, food costing etc. After training, a memorandum of understanding was developed between the organisation and research projects. After the terms and conditions were agreable to both, the team proceeded to establish units in different organisations.

The project staff assisted the organisation to establish sorghum enterprises. Project staff assisted in the

- Procurement of right type of equipment
- Installation of equipment
- Procurement of high quality raw material etc.

Two dehulling units were given to two organisation namely Old Age Welfare Centre and Subhadra Instant Foods in urban sector. In rural sector, one unit was initiated at Prodatur, Cuddapah in collaboration with DWCRA, DRDA. The DWCRA (Development of Women and Children in Rural Areas) scheme which is a sub scheme of DRDA has been planned for improving the status of women. One more unit is in the process of being established in Kurnool. Sale of dehulled sorghum, flour and rava (semolina) is promoted through super bazaars, departmental stores, hotels etc. in urban sector and house to house sale in rural sector. Production of baked foods for supplementary feeding programme was initiated in two places namely RASS and BGMS.

MONITORING THE PRODUCTION UNIT

Initially for three months, project staff were placed in the field to guide and monitor the women running the enterprise. Regular feed back information on dehulling, biscuit production, cost analysis, constraints faced were obtained through structured proformas. After three months, the field staff are with drawn, monthly visits are made to different units to see the progress of the unit. Growth monitoring and morbidity studies on beneficiary children are being carried out.

Various constraints were encountered while initiating these enterprises.

- Low prestige value of sorghum
- Instability in the production of sorghum
- Price fluctuation of sorghum
- Initial cost of establishment
- Lack of subsidy for coarse grains
- Lack of subsidy for dehuller, flour mills ovens etc. required for setting up production units.
- Permissions for three phase current etc.

SORGHUM DEHULLER - A NOVEL SELF EMPLOYMENT SCHEME

Mrs. VARALAKSHMI*

In November 1987, the College of Home Science, arranged a meeting of all the Mahila Mandals of Hyderabad city. In this meeting, the staff of that college explained to us about a simple technique for dehulling sorghum using the dehuller, methods for preparing good quality flour and semolina from dehulled sorghum, recipes of various products which can be made with dehulled sorghum and semolina flour and suggested several self-employment schemes using dehulled sorghum. 3 members of this Oldage Home participated in the above meeting.

At first, we took dehulled sorghum grain from the College of Home Science, milled it to flour in our Home and used for our inmates. These sorghum recipes were specially used for the diabetic inmates of our Home. Later, rice flour was substituted with this dehulled sorghum flour in all the snack items prepared at the Home such as pakodi, boorelu, cabbage cutlets, muruku, chapatis etc.

In our Home, snack items such as Chakkidalu, boondi and Karampoosa are prepared and sold to outsiders. In these snack items also sorghum flour was used in place of rice flour. This contributed to increased profits. People who come to

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* Member, Oldage Welfare Centre, Miapur.

purchase our other products like pickles and snacks used to buy dehulled sorghum flour and semolina sold here. Recognising our enthusiasm in this regard, the College of Home Science installed a sorghum dehuller at our home on an experimental basis. Staff from the college visited us frequently and extended their full cooperation in running this unit. They helped us in the electrical installation of the unit and trained some of our inmates in dehulling of sorghum, milling the grain to flour and semolina and in packaging these products. They also personally arranged for the sale of these products at specific super markets. At present, there is a sale of 4-5 bags of dehulled grain every month at our home. Full details of the sales in our Home are given in Table 1.

Table 1. Sale of sorghum products through super bazaars

Month	Sorghum (kg)	Sorghum flour (kg)	Sorghum semolina (kg)	Total (kg)
November 1988	40	35	50	125
December 1988	60	45	65	170
January 1989	60	45	65	170
February 1989	45	33	45	123
March 1989	75	57	80	212
April 1989	115	75	100	290
May 1989	50	30	40	120
June 1989	60	42	67	169
July 1989	69	47	68	184
August 1989	63	52	72	187
September 1989	-	170	150	320
October 1989	-	165	155	320
November 1989	-	180	140	320
December 1989	-	140	140	280
January 1990	-	150	130	280
February 1990	-	160	160	320
March 1990	-	165	155	320

A hotel, close to the Oldage Home is presently purchasing dehulled sorghum flour and semolina from our unit. Since this is close by and more convenient we are no longer supplying flour and semolina to the super markets. This has been handed over to another institute. Our institute being situated close to the ICRISAT - we are also taking up cleaning and dehulling of different grains required by ICRISAT at a price of Rs.3/- per kg.

Since our institute is a non profit organisation, we are selling only 4-5 bags a month, without expecting too high profits. In addition to sorghum we are also using this unit for dehulling of ragi and wheat. We are selling dehulled ragi flour and wheat semolina.

Since this dehuller was set up in our home on an experimental basis for only 2 years - we approached the Help Age Institute to grant us funds to acquire a new dehuller for the institute.

After a preliminary inspection the Help Age has agreed to buy the dehuller for the Home on the idea that, in future if the Home is unable to prepare snack items with this flour, it can atleast use the unit for dehulling of other grains for local residents at a rate of 0.50/-ps. per kg. and obtain some income for the Home.

So we are soon to get a new dehuller. We are grateful to the College of Home Science for involving us in this scheme.

Based on my experiences with the dehuller - I have a few suggestions to make.

1. It would be convenient if a sieve is set into the machine to seperate the husk from the dehulled grain as this process is now taking lot of time.

2. In addition to the efforts of the College of Home Science to increase sorghum consumption I request the Agriculture Department to seek new ways to improve sorghum production. Although we tried to acquire large amounts of sorghum from the villages around Miapur, we could not do so because of low production.

3. In order to be readily accessible to the common man this millet has to be made available in Fair price shops.

4. If the Government can subsidize the purchase of sorghum dehullers even the small and marginal farmers and people seeking self - employment can afford to buy them.

5. Social Service Organisations and Mahila Mandals should come forward to extend this technology to the general public and help them to obtain better nutrients at a lower cost.

6. In my opinion - it is the middle income population rather than the lower income groups who already consume more of sorghum, who need to be made aware of the advantages of using sorghum, in their daily diets. Sorghum flour and also Ragi are healthy and economical. Ignorance of nutritious foods available at low cost is one of the main reasons for poor health of many people.

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A P P E N D I X - III

PAPER ON NUTRITION & HEALTH

NUTRITION & HEALTH - OVERVIEW

DR. G. SUBBULAKSHMI

PROF. & HEAD, DEPARTMENT OF FOOD SCIENCE & NUTRITION

S.N.D.T. WOMEN'S UNIVERSITY

JUHU ROAD, BOMBAY 400 049.

PRESENTED AT

BCT - IDRC WORKSHOP

"TECHNOLOGICAL ADVANCES INTO THE LIVES OF RURAL WOMEN - RESEARCH PERSPECTIVES OF VOLUNTARY AGENCIES"

JAN 29-31,'91.

Research Priorities and Strategies in Nutrition and Health for Rural Women*

O. SUBBULAKSHMI
Prof & Head, Department of Food Science & Nutrition
S.N.D.T. Women's University
Juhu Road, Bombay 400 049.

The 'Basic Human Needs' (BHN) concept includes, food, health, shelter and education under 'material needs' and participation, cultural needs and self realization under non-material needs. The BHN approach to development implies that education and good health will facilitate participation and participation in turn will strengthen the claim for the material basic needs (ILO 1976). Thus improvement in quality of human life is inseparable from the strategy for development which should be focussed not just on men, who form only 50% of the total population but must take into account, the other 50% of the 'invisible' productive force - the women.

According to an United Nations Study, women represent half the global population and one-third of the labour force and are responsible for two-third of all working hours, but they receive only one-tenth of the world income and own less than one per cent of the world property. Thus the fundamental contradictions between significance and recognition has to be wiped out first.

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*paper presented at the workshop on "Technological Interventions into the lives of rural women - Research Perspectives of voluntary agencies" held at Yellamanchili from 29th to 31st January, 1991.

A few key points mentioned by the World Conference Report on "Forward looking strategies for Advancement of Women" comprises the need for technological interventions for improving quality of life.

> Attention to standards, design and delivering of appropriate technologies for women, improvement in access of women to scientific and technological education and training and enhancement of women's applications of technology for development and full and effective participation of women in technological advancement.

The aim of technology should be labour diversification drudgery reduction, improved energy conservation and higher and more stable income. Technology may be defined as the mechanical techniques and abstract knowledge which assist in the attainment of certain goals.

Economic development, education and allied social developments are closely interwoven with technology. Each unit in the production system tends to rely on other units in such a way that a disruption in one causes inefficiency in others. Therefore, to attack the problem from only one direction would be self-defeating. To recommend the introduction of labour saving devices is unhelpful if the women have no money to pay for them. To recommend the introduction of income generating activities is unhelpful when the women have no extra time to indulge in them. Almost every aspect of improving nutrition and health is a time-consuming process needing diversion from other activities such as food production which would have a nutritionally detrimental effect (Carr, 1979).

It is therefore necessary that any rural development project includes the three different aspects - (1) production oriented programmes, (2) consumption oriented programmes and (3) organisational linkage and development programmes.

1. Production oriented programmes should include:

   (a) development of agricultural and allied resources;

   (b) development of local handicrafts;

   (c) mobilisation and utilisation of local resources and

   (d) generation of employment opportunities and in turn increase in income.

2. Consumption oriented programmes must focus on:

   (a) public health and nutrition development;

   (b) provision of family welfare and medical facilities;

   (c) educational network development and

   (d) infrastructural development like water, power, transportation, marketing etc.

3. Organisational linkages must take into consideration:

   (a) institutional structure and managerial procedure;

   (b) socio-economic interactions for absorption of the benefits of developments by rural women.

Further, 'Household Food Security' (HFS) should be the overall guiding principle for agricultural developmental efforts aimed at improving nutrition and health. The concept of HFS consists of three elements:

1. Food Adequacy is defined as the availability of food which is nutritionally adequate both in quality and quantity and safe as well as culturally acceptable for the household members.

2. Viability in procurement concerns the way food is procured. The procurement should not conflict with the designed allocation of resources and time for fulfillment of other basic health needs. Furthermore, it should promote or in at least not conflict with non-material needs, i.e. participation, cultural values and self-reliance.

3. Sustainability concerns with ability to sustain food adequacy and viability in procurement in the face of crisis like food shortage due to seasonal variations or incidences of draught or floods.

Deficiencies in the existing interventions

Having worked out the developmental needs it is important to look into the lacuna in the existing strategies before deciding the course of action to be taken.

(1) There has been a tendency in the existing innovations to focus on the negative aspects, e.g. lack of care of children, number of foods per day, infant mortality and malnutrition of

under-fives. Although, this aspect is important to highlight, there is need to balance the negative aspects with positive strategies that are used by the households that do not suffer from malnutrition. In order to do this one has to go beyond generalization and look for the characteristics and processes of diversity.

(2) Main emphasis so far has been on women's productive activities. Not enough studies are available on the other aspects of 'Road to Nutrition' like post-harvest activities loss at storage level and technologies to deal with them.

(3) Most work has a 'sectoral approach' - e.g. studies on labour/time benefits, there is little work on systematic analysis of the relationships between the various facts of rural livelihood patterns.

(4) Women's productive activities have been identified only with reference to major crops like wheat, rice, maize and other cash crops. Others like vegetables, fruits etc. have been neglected, pointing to lack of attention towards the role of vegetables and fruits in nutrition and national economy.

(5) Year round studies are few and thus, under-employment in off season or after-native sources of income lucrative than the seasonal ones are all missed.

(6) Cultural impact, beliefs, home remedies are undermined. No attempt is made to prove or disprove them on scientific grounds.

Research needs

1. Women's work at different points of the 'Road to Good Nutrition in pastoral and fishing communities needs to be identified.

2. Under what circumstances will women overcome social norms which prevent them from participating in certain applications of technology? - needs to be assessed.

3. What can women and men do together and what can they not do? - needs to be identified with regard to technology application. These will reveal the conditions required for changes in the gender - related divisions of labour and technology.

4. Inter-family and inter-community support system (e.g. informal local exchange system) will have to be identified and strengthened.

5. Participatory action research for women will be most successful towards developmental efforts.

6. Women's co-operatives in improving health and nutrition have to be tried out. Stephen Wexler says - 'Poverty will not be stopped by people who are not poor; if poverty is stopped it will be stopped by poor people themselves; and poor people can stop poverty only if they work at it together.'

7. Women's coping strategies presently followed need to be explored.

8. Untapped unconventional sources of foods must be unearthed for fuller utilisation.

9. Enterpreneurship among rural women needs to be developed and small scale, tiny, cottage industries units of food processing must be set up. Research on better utilisation of the products and marketing should be taken up side by side. For example bee-keeping could be an excellent cottage industry if products like honey jam, honey lemon drink, honey soap and shampoo can be developed.

10. Skill development and training must be provided as a support system for agro-based industries. An in-built training programme in 'Anand Pattern' of dairy co-operatives could serve as a model.

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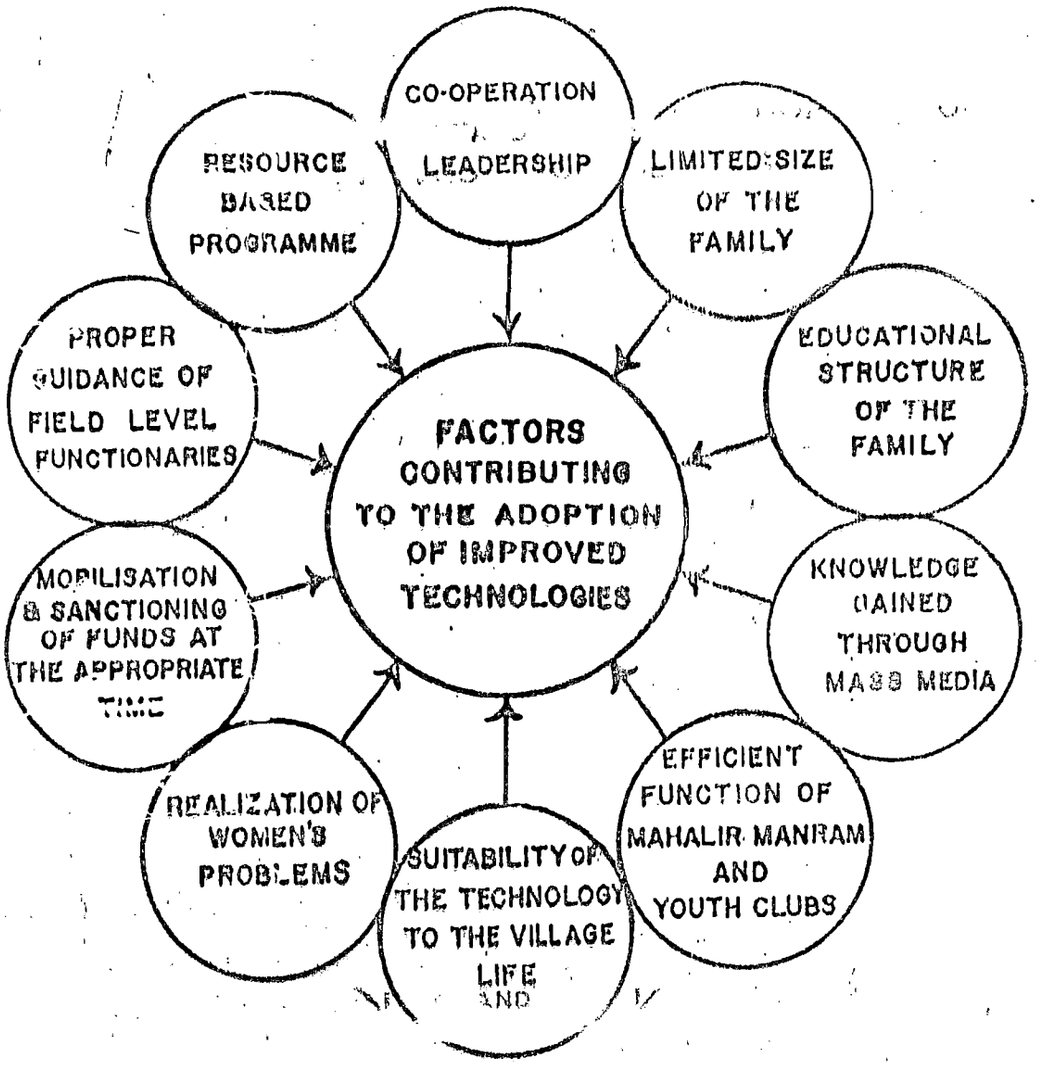

Figure-1

FACTORS CONTRIBUTING TOWARDS ADOPTION OF IMPROVED TECHNOLOGIES

CASE STUDY - NUTRITION

SANJOY GHOSE

RURAL HEALTH RESEARCH AND DEVELOPMENT TRUST

BIKANER, RAJASTAN

PRESENTED AT

BCT - IDRC WORKSHOP

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The Indira Gandhi Nahar Pariyojna - formerly known as the Rajasthan Canal - was conceived in 1948, after the Indus water treaty, and envisaged irrigating large tracts of Ganganagar, Bikaner and Jaisalmer districts, bringing water from the Sutlej and Beas to parched western Rajasthan.

Work commenced in 1951, with the Planning Commission approving an outlay on the project of Rs.66 crores.

Today, forty years on, the Canal is still making its way through the sandy reaches of Jaisalmer. The cost of the project is estimated in the region of Rs.2000 crores.

The Canal has altered life in its wake. Small, nuclear families now inhabit "dhanis", irrigated fields, all along the water courses. Settlers are from all over the State, and in some cases, as in the earlier reaches, even from the Punjab and Haryana. Settlements are known by their location on the "distributary" or minor - for instance close to Lunkaransar, people are settled on the "LKD", and at different distances qualify for different numbers - such as 1 LKD, 5 LKD etc.

Along with the water, and improvements in living conditions, have come a host of other problems : the incidence of crime and violence has increased, and the social fabric that bound traditional village settlements together has disintegrated, to be replaced with the "invisible hand" of the market.

This paper deals with one aspect of the health and social impact of the Rajasthan Canal - that on the nutritional status of children.

The reason this needs to be studied is obvious.

If we claim that the Canal - or for that matter any intervention aimed to increase incomes, or "standard of living" has been effective, one of the most significant questions that needs to be answered is, how have the children fared ?

Even in today's world of quantification, this is not as simple as it seems.

One difficulty is in establishing a precise cause-and-effect relationship. While we can say that with confidence that nutritional status is different in the two ecologies (irrigated settlements, and unirrigated, or "traditional" villages), it is not possible to disaggregate exactly to what extent this is due to the spread of irrigation itself, or influenced by other linked variables, such as indebtedness (especially of new settler households), or the lack of a joint family and other "support" structures.

The second difficulty is the "so what" argument. It is quite possible, for example, that in maximising utility (if we accept that concept) the family or individual may not consider the nutritional status of children as important as other choices - and that in measuring that indicator, we are imposing our values of what we understand by development on the family, or society.

Market-led development has its share of detractors : this paper is not challenging that premise at an ideological level. Integration into the market, and the world system as a whole is inevitable : what we need to focus on however, is on how best the change can be managed in such a way that the poor are not systematically left out of the development process, "political will" and the best interests of development planners notwithstanding.

The impact on the health of children

A survey was carried out by trained extension workers of the Urmul Trust - a non Governmental organisation working with poor communities in Bikaner and Jodhpur districts of Western Rajasthan - in late 1987. Three "dhani" areas in Lunkaransar Tehsil - 1 LKD, Goplyan "B" (from the name of the milk cooperative procuring milk from the dhanis around RD 232 of the Lunkaransar Lift Canal) and 5 LKD were extensively studied.

One of the variables studied was the health status of children under five, measured by using the standard "weight-for-age" technique. Workers were trained to probe for exact age, using indigenous calendars, and used standardised "Salter" weighing scales for all the children.

The children were then classified into four categories - normal, first, second and third degree malnutrition. The classification was made on the basis of the WHO standard, modified by ICMR, and developed as a convenient "growth chart" by the Voluntary Health Association of India.

Three villages in the vicinity, which were not in the command area, were also the subject of the same survey, carried out to plan a primary health care intervention.

These three villages - Rajpura, Munafarsar, and Dhirdan - are similar in most other respects - caste, land and animal ownership, and education. The main difference is the "village" identity in the traditional villages, which have an institutional framework that binds them - both in formal, newer structures, such as cooperatives and panchayats, as well as in older forms of cooperation and sanction, such as "jati" (caste) panchayats etc.

All children under five were weighed, a total of 480.

The data were disaggregated by percentile (nutritional status) and sex, and analysed for differences, using the Kolgorov-Smirnov non-parametric statistical test. This was recommended as a robust, unbiased estimator, good for rank-ordered comparitive data. Procedural details can be found in any advanced statistics textbook.

Data and calculations are at Annexure I.

While the data show no significant difference between children in unirrigated and irrigated areas overall, there is a significant (@10%) difference between the female children in irrigated and unirrigated areas, showing the status of female children in the irrigated areas to be worse than that of their sisters in the neighbouring uncommand villages.

This is a cause for concern.

Limitations of the data regardless, the fact that the variation is in the opposite direction than we expect from intuitive logic - that with improved standards of living, nutritional status also would improve - is disturbing.

What could be the reasons for this kind of observation?

We can posit three, on the basis of field experience.

One is that the switch in cropping pattern, from traditional cereal crops - bajra, moth, guvar - to non-traditional cash crops, such as groundnut and mustard, both of which though excellent sources of protien have not found their way into the diet pattern of the area - has meant that increases in income have not been spent on food, but on other items. Debt for instance in the irrigated areas is much higher than in the uncommand, which might mean that so-called "surpluses" were in fact being used to service debt, or perhaps being spent on a different mix of commodities.

The second reason could be the increased work load on the woman in the irrigated areas. Faced with a constraint in the amount of time available, she manages the best she can, but in the process, female children, traditionally neglected, tend to bear the brunt, being equated as "non-essential" work. As opposed to collecting fodder, for instance, which has a direct productivity and income link.

We have no data to show how the pattern of dowry is changing, but it is universally accepted that there has been a secular increase, which continues. Could it be that the perception of ownership of irrigated land increases the expectation from the girls' parents ?

The third possible conjecture could be that since the data also includes information on "semi-permanent" migrants from uncommand ares into the irrigated areas in search of work - although very limited in this sample - there may be a mis-classification at work.

Whatever the case, it is difficult to separate "values", faced with this kind of evidence. Certainly it is a matter of individual choice of how income is disposed off, but if the condition of girl children is worsening, surely it must raise the issue of what the Canal - or for that matter the State - meant by "development" ?

NUTRITIONAL STATUS OF CHILDREN IN IRRIGATED AND UNIRRIGATED VILLAGES

	NI,M	I,M	NI,F	I,F					Totals NI	I			
0	52	53	43	42	0.440677	0.407692	0.032985	0.467391	0.3	0.167391	95	95	0.452380	0.351851	0.100529
1	33	33	17	41	0.720338	0.661538	0.058800	0.652173	0.592857	0.059316	50	74	0.690476	0.625925	0.064550
2	24	23	20	34	0.923728	0.838461	0.085267	0.869565	0.835714	0.033850	44	57	0.9	0.837037	0.062962
3	9	21	12	23							21	44			
	118	130	92	140							210	270			

D (Table)=0.1637366
D(Calculated) = 0.167391

D (Table)=0.112250
D(Calculated) = 0.100529

Non irrigated group

months	Okay male	Okay female	I male	I female	II male	II female	III male	III female	Total male	Total female
zero to five	9	5	0	1	1	2	3	0	13	8
six to eleven	6	4	1	1	4	1	1	1	12	7
twelve to twenty three	13	12	5	3	1	7	0	7	19	29
twenty four to thirty five	7	3	12	6	5	3	1	0	25	12
thirty five to sixty	17	19	15	6	13	7	4	4	49	36
	52	43	33	17	24	20	9	12	118	92

Irrigated group

months	Okay male	Okay female	I male	I female	II male	II female	III male	III female	Total male	Total female
zero to five	6	4	5	5	1	3	1	4	13	16
six to eleven	11	6	4	7	1	6	1	2	17	21
twelve to twenty three	12	11	4	8	2	8	10	2	28	29
twenty four to thirty five	5	2	6	4	2	4	1	4	14	14
thirty five to sixty	19	19	14	17	17	13	8	11	58	60
	53	42	33	41	23	34	21	23	130	140

CASE STUDY - NUTRITION

R.ABEL, MUNIRAJULU ET. AL.

RUHSA DEPARTMENT OF CHRISTIAN MEDICAL COLLEGE &

HOSPITAL, VELLORE.

Presented at

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THE IMPACT OF NUTRITION EDUCATION IN A RURAL SOUTH INDIAN COMMUNITY

R.ABEL*, PARVATHY DEVARAJ*
MUNIRAJULU*, R.SAMPATH*

*RUHSA Department of Christian Medical College and Hospital, Vellore.

SUMMARY

Malnutrition being one of the commonest morbidity condition seen in many rural populations, many attempts have been made to overcome this problem. However it appears that prevention may be more cost effective than treatment or rehabilitation. This paper describes RUHSA's attempts in Nutrition Education in a rural community. Nutrition Education was provided of 91 mothers over a period of 1 month. A control of 144 were simultaneously chosen to see the impact of nutrition education. They were followed by for 3 years.

Among the trained mothers 92% started breast feeding by the 4th hour while only 8% started among controls. On the other hand among controls 66.5% started breast feeding only on the 3rd after delivery. Among trained mothers 83.5% started supplementary feeding by 4-5 month against 27.8% among controls, 22.2% started supplementary feeding only after one year. Similarly there was a larger number adopting permanent method of family planning and thus delaying conception among trained mothers than controls.

Introduction

Since malnutrition is a leading health problem a number of interventions are being attempted. The major interventions are supplementary feeding, growth monitoring and promotion, food fortification, nutritional rehabilitation in day care centres and nutrition education. This article describes the nutrition education organised by the RUHSA Department of Christian Medical College & Hospital, Vellore, South India.

Soon after the RUHSA programme was established in 1977 a baseline survey carried out in K.V.Kuppam Block indicated that 23.5% children below 5 year of age had severe malnutrition as detected by measuring the mid upper arm circumference. Therefore this was treated as a priority problem and a programme was planned to decrease the levels of malnutrition. Two major intervention activities were considered. They were feeding programmes and nutritional rehabilitation. A review of then available literature indicated the limitation of a feeding programme, as well as the cost of a hospital based rehabilitation programme. Further it was indicated that these two activities tended to treat children with malnutrition and may not easily break the malnutrition cycle. Nutrition education was identified as the activity that would help in preventing malnutrition in the preschool children and this was chosen.

A key question that was considered was whether nutrition was related to the availability of food, ignorance of the right types of locally available nutritious food stuffs or both. In choosing nutrition education it was assumed that ignorance was the major factor. As an initial trial the nutrition education programme was carried out in 8 specific areas to learn lessons before extending this to the entire block. The objectives of the programme were as follows; 1. to educate mothers, especially from the families of weaker section on health, nutrition and socio-economic aspects, 2. to promote better ante natal and under 5 services for serving the nutritionally vulnerable groups in an effective manner, 3. to train the volunteers for carrying out systematic nutrition, health education and family care services 4. to organise suitable health care, social education supplementary feeding to community for the total promotion of health status 5. to promote long term socio-economic changes for the weaker sections of the community.

Methodology

The methodology for the Nutrition Education Programme involves training of mothers in the area of Nutrition and its allied health and social aspects. These mothers were trained by RUHSA Nutrition staff and Health volunteers. The mother were selected by the * Family Care Volunteers (F.C.V) under the guidence of * Rural Community Officer (R.C.O). A curriculum for training these mothers was developed and a pre-evaluation was conducted through a structured questionnaire. An evaluation was conducted at the end of first year, second year and third year. This evaluation was conducted to assess the impact of Nutrition Education Programme.

Training Process

The training was conducted in Centres located as close as possible to the mothers. Each training programme lasted upto 30 days. Each course had between 25 to 30 women predominantly with children below the age of 15 months.

A need based curriculum was developed the curriculum content included topics on child rearing, child feed practices, immunisation, nutritious diet care during pregnancy, lactation and illness, changing role of women, special care for preschool children and income generating schemes.

Participatory training methodologies like demonstration, role plays, group discussions and lectures with appropriate audio-visual aids like flash cards, flannel board posters, filmstrips, slides were used.

Evaluation

At the culmination of Nutrition Education Programme an evaluation of mothers trained in the first four batches was conducted at the first, second and third year. The evaluation conducted in the third year will be described in this paper.

A total of 113 mothers who went through the Nutrition education in 4 batches in the year 1980 were selected for this study. 22 mothers had either migrated or for some or other reason were not available for this study. Therefore only 91 mothers were interviewed. A specially prepared questionnaire was used for this survey to collect information on feeding of colostrum, starting of supplementary feeds, family planning conception. To obtain a comparison 144 controls were also selected from the same socio-economic groups, parity, age and educational levels.

Results

Table I indicates the difference in feeding of colostrum by those receiving training and controls. Only 18.1% controls representing the general population start the first feed by the 4th hour, whereas 92.3 percent mothers who received training start breast feeding by the 4th hour ($P < 0.001$).

Table I

First Breast Feed Given

	4th hour	6th hour	2nd day	3rd day
Beneficiaries (N=91)	92.3%	2.2%	1.1%	4.4%
Control (N=144)	18.1%	9.1%	6.3%	66.5%

Pattern of initiating feeding

Table 2 shows the pattern of introducing supplementary feeding. 72.2% of mothers in the control start supplement feeding only after the 6th month. With 36.8% starting after 9 months and 22.2% after 1 year. After training 83.5% start supplementary feeding by the 4th month. ($P < 0.001$).

Table 2

Starting of supplementary feeds

	4-5 months	6-8 months	9-12 months	After 1 year
Beneficiaries (N=91)	60.5%	15.1%		1.1%
Control	27.8%	35.4%		22.2%

Among the beneficiaries,36.3% had undergone permanent method of family planning compared to 22.2% controls ($P < 0.001$). Those adopting temporary methods were uniformly low among both the beneficiaries (~~8.5~~%) as well as among control (2.1%).

Since there appeared to be difference between the actual temporary methods adopted, the actual conception data related to this was obtained and it is shown in Table 3. 27.8% mothers without training had conceived twice, during the 3 years preceding the survey as against only 9.9% among them trained ($P > 0.001$).

Table 3

Conception Rates during the 3 year study period

	Not Conceived	Conceived Once	Conceived twice
Beneficiaries (N=91)	20.8%	81.6%	9.9%
Controls (N=144)	5.0%	68.6%	27.8%

Note: The course contents consisted of general principles of Nutrition, diet during pregnancy, antenatal care, diet during infancy and pre-school period, diet during illness, child care including immunisation, family planning and communicable diseases.

Comparisons of birth weight showed a mean weight of 3.15 kg for 26 beneficiaries children and a mean weight of 2.7 kg for 17 control children showing an increase of 0.4 kg for the children of trained mother ($P > 0.1$).

Discussion

Even though it is generally accepted that there is universal breast feeding in India, many mothers start breast feeding only on the second or third day of birth. Knowing this and introducing this in training programme helps to change the pattern. However there is resistence to such changes from the old generation.

The pattern of initiating supplementary feeding in the general population is not as bad as that of initiating breast feeding. However there is a need for improving the present nutrition and an education programme can bring about the change.

The nutritional status of children present at the time of training did not show much improvement even after training, their mothers while children born subsequent to training showed a shift (though not statistically significant) towards are normal weight for age.

When birth weight was observed the trend seems to be even better. Cautious interpretation has to be given to the data on birth weight as the samples are low. However the general pattern emerging is that education provided to mothers during the ante natal period itself seems to more favourably affect the child than that provided after the birth of the child.

Trained mothers have better utilisation of family planning especially relating to permanent methods. Inspite of intense education on the use of temporary methods. However there is a difference in conception rates. It is possible that mothers, are using other non conventional temporary methods. On the other hand it could be that mothers are not divulging the actual temporary methods used either due to fear or shyness.

Since this action research was part of a service programme on providing nutrition education to mothers, comparison with other methods of nutrition intervention is made in other studies. The critical question is, should efforts be made to organise feeding programmes or education programmes, which is more effective. Assuming the differences shown are real, then an education programme may have a long lasting effect and may be one of the important interventions that can effectively break the cycle of ignorance, poverty and malnutrition.

Community participation in the training was an important factor in this programme using adult learning techniques such as theory followed by practice, review and reinforcement were useful techniques for behavioural changes. Restricting the number to thirty was also beneficial.

We acknowledge all the RCO's, Health Aids and Family Care Volunteers for providing the valuable assistance for completing this study. We would also like to thank Mr.V.Sampathkumar, Co-ordinator, Community Nutrition Centre of RUHSA for his comments.