

ADDING VALUE IN RICE PRODUCTION: A CASE STUDY OF WOMEN'S PARTICIPATORY EVALUATION OF A RICE FLOUR MILL IN CENTRAL LUZON, PHILIPPINES

T. Paris, C. Diaz, E. Bautista and R.F. Orge
International Rice Research Institute
MCPO Box 3127, Makati City
1271 Philippines

ABSTRACT

In the rural rice growing areas in the Philippines, conversion of milled rice to flour, particularly of glutinous varieties, is one of the traditional roles of women. Adding value to rice can be an important strategy in generating income of women. However, poor women still use the grinding stone in processing milled rice into flour. This requires considerable drudgery and takes too much time. Moreover, the output produced using this method, is wet flour which easily gets spoiled and contaminated. These constraints affect women's potential in maximizing their income from processing rice food products.

This study was conducted: a) to test, and evaluate the technical performance, economic viability and its social acceptability by members of a women's association; and; b) to identify the factors which can influence the successful adoption and sustainable use of this machinery at the village level. This study has shown that the rice flour mill has the potential for increasing women's income. However, several factors should be considered such as: appropriateness of the technology, provision of "hands - on" training on the operation and simple trouble shooting of the machine to women, facilitate women to organize themselves, foster close collaboration between social scientists and agricultural engineers, use a gender sensitive participatory approach with the involvement of the men and women in each stage of the research process and to target for full capacity utilization of the machine for economic viability.

1. INTRODUCTION

The significant roles of rural women in rice production, post harvest activities, such as drying, seed selection, seed storage and processing in Southeast and SouthAsia has been well documented (IRRI, 1985¹, Paris 2000²). Women are also mainly responsible for adding value to rice by parboiling rice and preparing rice products such as rice delicacies, puffed rice, and other rice products for home consumption and market as well as for social and religious ceremonies (Begum, 1985)³. It is women's additional income from processing rice into other food products which help poor families survive during the hungry periods of the year However, they have been constrained from contributing fully to the development of this sector by their lack of access to technologies (Paris, 1988)⁴. Agricultural engineers rarely design machinery or implements for women farmers, because their focus was on large machinery for men. There are also fears that once the traditional tasks of women are mechanized, they loose their income when take over. For the past years,

various workbooks on technologies for women in agriculture have been published (UNICEF 1977⁵, Sandhu and Sandler 1986⁶ Quick and Paris 1995,⁷) but many of these technologies still have to be tested, evaluated, adopted and adapted by women in specific socio-cultural environmental settings. Energy-saving mechanical technologies may too expensive to own on an individual basis and often not socially and culturally acceptable to the intended users. Thus it is important for scientists to assess the likely implications and impact of agricultural technologies. (Paris and Pingali 1995)⁸

In the rural areas in the Philippines, conversion of milled rice to flour, particularly of glutinous varieties, is one of the traditional roles of women. Making rice flour is still done at the household level using the traditional method of hand turned stone mill, sometimes known as "querns" (Axtell et.al, 1994)⁹ This traditional method requires considerable drudgery and takes too much time (2 kg/hr). Moreover, the output produced using this method, is wet flour which easily gets spoiled and contaminated. The resulting rice products must be consumed immediately owing to their short storage life. These constraints affect women's potential in maximizing their income from processing rice food products. Unfortunately, not much attention has been given to home- based value-adding technologies for rice food products and to identify constraints and opportunities for increasing income.

One of the available technology options which matched women's constraints in rice food processing is the rice flourmill using the dry process (PhilRice 1994)¹⁰. Since the prospective end users of the rice flour mill are the women, their participation and feedback are crucial in the design and development process of the machine. Thus, this machine was brought in a village of Tampac, Nueva Ecija, Central Luzon for testing and evaluation by the members of the Women's Association in this village in 1994. This initiative is under the project "Gender in Rice Research and Technology Development project (formerly Women in Rice Farming Systems project)" which seeks to address the technology needs and provide technology options that can increase the income of poor rural women engaged in rice production, post harvest, and processing rice food products (Paris, 1998)¹¹. The objectives of this research were: a) to test, and evaluate the technical performance, economic viability and social acceptability of a rice flour mill; and b) to identify the factors which can influence the successful adoption and sustainable use of this machinery.

II. MATERIALS AND METHODS

2.2 The rice flourmill.

The PhilRice flour mill (household model) weighs 30 kg and has a height of 109 cm. (PhilRice, 1994)¹² It has a hopper, cyclone separator, rotor chamber and electric motor. The cyclone separator reduces air velocity, allowing fine dry flour to settle into the container bag at the lower end of the cyclone separator (Figure 1). The prototype rice flour mill has the following features:

Operating requirements

- Power - 1.5 kw (electric motor)
- Labor - 1 person

Performance

- Milling capacity - 10 kg/hr
- Power requirement - 0.11 kw-hr/kg
- Particle size - 0.28 mm
- Flour recovery - > 95%

Its outstanding features are:

- Produces fine, dry flour which can be stored for six months and suitable for rice food products
- Dry rice flour can be used as substitute for wheat flour for some bakery products
- Simple, low cost design makes it easy to fabricate, operate and maintain
- Can be used for corn, soya, mungbean and coffee
- Can be easily operated by a woman

2.3 Methods of collecting information.

Information collected from this research came from formal and informal interviews, focus group discussions with women and field level testing and evaluation of the prototype rice flourmill. In this case study, the agricultural engineers designed the prototype machine but made the modifications and refinement based on the feedback from the women cooperators. The mode of participation was collegial and collaborative. In this case, the machine was operated by one of the members and managed by the Women's Association. The machine operator recorded the volume processed and income generated from the mill. The social scientist and agricultural engineer monitored the performance of the mill.

2.4 Process of participatory research and technology development

2.4.1 Needs assessment. An earlier study by Diaz, et al., 1994¹³ revealed that the women engaged in rice farming and rice processing in this village did not have access to information on new technologies such as labor saving machinery for processing rice, seed management, new rice varieties, etc. Women should not be expected to know what technology they want unless they know that there are technologies which can help them perform their tasks better and unless they test these technologies by themselves. Thus, when a micro rice mill was first brought to this village, women immediately showed their interest in testing and evaluating this machine. This encouraged women to request for other technologies such as the rice husk stove and rice flour mill (Vasallo and Diaz, 1994¹⁴ Diaz, et.al, 2001¹⁵). In this village, rural women were found to be heavily involved in processing rice into rice cakes. On the average, they process around 2 kgs per hour using the traditional method (Diaz et.al, 1994¹⁶).

Similarly, when the rice flour mill was brought to this village, the women immediately showed their interest to test it.

2.4.2 Testing of the machine by the prospective users. In 1994, a prototype of rice flour mill machine was brought to the village of Tampac, Guimba, Nueva Ecija for initial testing and demonstration to the members of the Women's Association in this village. Figures 2 and 3). Based on this activity, the women suggested some modifications. These are to:

- improve the sealing to avoid flour leaks on the milling chamber;
- provide better flour discharge chute to accommodate various containers used by the women and reduce the dust;
- provide transport wheels for ease in mobility.

Based on these suggestions, the machine was returned to PhilRice. After making the modifications on the machine, it was returned back to the village for further testing and evaluation.

2.4.3 Obtaining feedback from women through interviews. The mill was tested and evaluated for three years of testing and evaluation. Forty women representing 33% of the farming households in the village, were interviewed using a structured questionnaire. This questionnaire included questions on the social acceptability of the flour mill. Information regarding the problems, constraints in technology adoption and suggestions for further improvement of the efficiency of the machine were obtained through informal focus group discussions with different groups of women who used the machine.

2.4.4 Organizing the management of the machine. Since the machine was too expensive to be owned by one household, it was agreed that its management be undertaken by the existing Women's Association. The rice flour mill was loaned from the Gender in Rice Research and Technology Development project at IRRI. The management of the rice flour mill by the Women's Association in Tampac, Nueva Ecija was organized similar to that of the rice micromill. One member who was trained in operating the machine was assigned as the operator. The association agreed that the processing fee be divided into labor cost (40%), power consumption (20%), and share of the women's association (40%). They also agreed that the share of the women's association be accumulated in a general fund. This will be used specifically as emergency loans for members during difficult times. A monitoring form was supposed to be filled up to record the actual field performance and income of the machine. However, after two seasons, the operator was found to have neglected her responsibility. When the machine broke down in 1997, the operator failed to have it repaired. In August 1998, the women's association decided to change the operator. This time, the women operator who received training on how to operate the mill, turned out to be a better manager.

III. RESULTS AND DISCUSSION

3.1 Description of the Research Site

The rice flour mill was evaluated in Tampac II-III, Guimba, Nueva Ecija, and a major rice-producing province in the Philippines. Tampac II-III is a partially irrigated village located in the Southern part of the town proper of Guimba, Nueva Ecija. The name of the village "Tampac" was derived from the landscape position of the village, which means "high elevation." Although this village is only seven kilometers to the town, transportation is expensive and difficult due to the bad roads, especially during the rainy season. Ninety percent of the households are engaged in rice farming. Of the total rice area of 187 hectares, 134 (72%) and 53 (28%) are planted during the wet and dry season, respectively. Farmers who have access to residual moisture grow mungbeans after rice but majority of them leaves their fields fallow as grazing lands for their animals. Sixty two percent of farmers are landowners, while 38% are tenants. (Diaz et. al.,1994¹⁷).

3.2 Socio-economic Characteristics of Women Cooperators

Forty women in Tampac II-III participated in this research. Their characteristics are shown on Table 2. On the average, wives and husbands are in their early forties. Wives are two years younger than their husbands. Both husbands and wives have formal education. On the average a household has five members. Of the total households who owned their farms, the majority (73%) has more than 1 hectare of land. Rice farming is the major source of income of the sample households. In this village, women are actively involved in rice production and processing rice. Aside from working as unpaid laborers in their own rice farms, they earn additional income by working as seasonal wage laborers in other farms, rearing/fattening pigs, taking care of goats, buying and selling vegetables, and making rice cakes.

3.3 Evaluation of the rice flourmill at the village level

The rice flourmill was evaluated by the women in terms of technical performance, economic returns, social and cultural acceptability. These are discussed below:

3.3.1 Uses of rice flour. Different categories of women benefitted from the use of the mill and use rice flour in many ways. These are the women who make rice products for home consumption, women who sell rice cakes, woman - operator of the flour mill, mothers with infants, and the other members of the Women's Association who borrow loans. The use of rice flour is seasonal with higher demand during the later part of the year. Women who make rice cakes earn about P1000 per month on the average. Poor mothers in the village used fine rice flour as milk substitute (locally called am) to their children below 2 years old. With the rice flour mill, one household can use 2 kgs per month. They mill their rice into flour every two weeks. A few women also used rice

flour as substitute for starch for clothes. The results of their evaluation are discussed below.

3.3.2 Technical Evaluation. On an average, the rice flourmill can process 10 kg/hr compared with the traditional method of 2 kg/hr. The field performance of the rice flour mill was evaluated from August 1998 to June 2000. Table 3 shows the results of the performance (volume of rice processed) of the mill and the benefits derived by the women's association. In 1998, the total rice processed was below 400 kilograms. This was low because proper recording of the performance of the mill started in the later part of the year. However, in 1999, the total volume processed by the machine tripled.

The peak months of the rice flour mill were from October to December. This peak months coincide with special holidays including All Saints' Day, Christmas and before New Year. During these months, it is a tradition for the women to prepare different rice cakes.

3.3.3 Economic returns. Actual field performance of the machine showed that for two years (August 1998 to June 2000), the machine processed more than 2200 kgs of rice flour, with a gross income of 15,100 pesos (Table 3). The labor cost (operator's share) was 6000 pesos (40% of the total gross income). The operating expenses (cost of electricity at 20 percent of the gross income) amounted to around 3000 pesos. The net income to the women's association (40% of gross income) was about 6000 pesos. With the labor cost of 6000 pesos for 221 hours (the capacity of the machine is 10 kilograms per hour and the total quantity processed was 2221 kilograms), the income of the operator is estimated at 27 pesos per hour. Usually, the operator can work for 3 hours in processing rice. If the operator, who is also a member of the association, will take up the operation of the rice flour as a full time job, her income would be 81 pesos per day.

3.3.4 Women's perceived benefits of the portable rice flour mill Aside from the high volume of rice flour processed and the substantial income generated from the milling services, the women perceived other benefits from using the rice flour mill. These are the following:

- **Accessibility to a light machine and savings on transport cost.** All the women evaluators claimed that having accessibility to the machine was quite important to them. Since the machine could be kept in the village, they did not have to spend their time to go to the town just to have small quantities of their rice to be processed into flour. In this village the women leave their milled rice with the operator, continue with their domestic and farm work and get the flour later. In many instances the operator delivered the rice flour to them. Moreover, they saved P25 (2-way per person) on transport costs to town.
- **Lower cost of processing rice flour.** It was cheaper to process rice flour using the small mill compared with the commercial mill.

Customers paid P7 kg in 1999 and P8 per kg in 2000 of milled rice flour. The cost of processing rice flour in town was P18 per kg when they have the rice processed (two passes for finer output).

- ***Better quality of output.*** The women observed that the quality of the rice flour processed from the small flourmill was finer compared to that processed in the town mills. The quality of rice flour was very important to the women. Due to the finer quality of the rice flour, poor mothers who could not afford to buy canned or powder milk have developed an instant baby food drink. They mix the fine dry flour, which can be stored, with hot water, and add sugar to produce instant food drink for nursing babies. Thus, the rice flour should be very fine to be able to pass through the rubber nipple of feeding bottle of children. The women observed that their child's gas pains were reduced when fed with diluted rice flour. They also observed that their children were more energetic and healthier when fed with rice flour was used as milk substitute. They believed that rice is a good source of energy and contains important micronutrients.
- ***Produces dry rice flour which has longer storage life.*** The women prefer the dry rice flour because they can store it for a longer period. This enabled women to make rice cakes depending on their available time and use rice flour as milk substitute for infants.
- ***Village level management of the machine enables customers to pay on a deferred payment basis.*** Since the Women's Association managed the machine, the customers, including its members, could pay the milling cost on a deferred basis. With this arrangement, women were able to use their cash for other priority expenses.
- ***The machine was instrumental in empowering women as a group.*** Income from the milling service was used for maintaining the machine and lending money to the members of the Women's Association in the village. Through informal interviews, the women revealed that aside from these benefits, the machine was instrumental in empowering them as a group. They cited a similar experience with the micro rice mill, which was also tested and evaluated in the village. The micro rice mill was instrumental in improving the status of women through the establishment of a small enterprise managed and controlled by women. The women in the village learned to formally organize collectively to manage the income from the mill (Diaz et. al., 2001¹⁸). Since their husbands were included since the beginning of the project, they gave their wives independence and full control of the machine. They only helped in transporting the machine.

IV. POTENTIAL INCOME FROM THE RICE FLOURMILL

The potential income that can be generated from the rice flourmill depends on the extent of its capacity utilization. Table 3 shows that a milling fee of P8 /kg of rice flour, the gross income under full capacity is about P185,000. This is under the assumption that the machine will operate at 10 kilograms per hour (capacity of machine), 8 hrs/day, 24 days in a month and 12 months in a year. If 20 percent of the gross income is set aside for electricity and other maintenance cost, the net potential income is estimated at P150,000. However, the 12-month operation of the machine cannot be realized, since rice flour is used only on special occasions and as milk substitute for young children. If the machine can operate at a full capacity, the operation of the rice flourmill would be highly profitable. The cost of the machine at 18,000 pesos can be recovered for a shorter time period.

The women's association keeps 40% of the gross income of the machine, as group fund, which the members could utilize as capital in small enterprises, like swine raising, goat raising, tending small variety stores and making rice cakes. The funds, which they borrow, can also be used for school and medical expenses. If the rice flour mill can operate at full capacity, the women can have enough funds to support their micro enterprises. The estimated income, which can be accumulated from the operation of the machine, is about P75,000. Each member of the women's association can loan around 1,850 pesos per year from this income. This amount can help women avoid borrowing loans from private moneylenders who charge high interest rates. Thus, there is a need to increase the utilization of the rice flourmill by encouraging more women to patronize its use. More efforts should be made by the association to develop other rice food products for the market outside the village.

V. SUMMARY AND CONCLUSIONS

This case study described the participatory process of testing and evaluating a prototype rice flour mill by the members of a Women's Association in a rice-farming village in a major rice bowl in the Philippines. The rice flour mill was evaluated in terms of its technical performance, economic viability, social and cultural acceptability. If the machine can be fully utilized, it has the potential for providing the women's group with income that can be used to provide loans for other women. Testing and evaluation of the machine revealed that the adoption and sustainability of the rice flour mill will depend on many considerations such as: introduction of an mechanical technology should be appropriate to the intended users - in this case the women; provision of "hands - on" training on the operation and simple trouble shooting of the machine, encourage women to formally organize themselves, close collaboration between social scientists and agricultural engineers from the start of the project, use a gender sensitive participatory approach with the involvement of the women in each stage of the research process and target for full capacity utilization of the machine. This experience has shown that research and technology alone can not alleviate rural poverty and remove women's

constraints in increasing productivity. The linkage of the rural sector with the private sector (machinery and repair shops), and better rural infrastructure (roads, markets) should be developed to encourage more agro-based small scale enterprise run by women.

VI. RECOMMENDATIONS

Based on this experience, we recommend several guidelines which should be considered for successful introduction and diffusion of mechanical technologies to women. These are:

- a) **Introduce intermediate technologies which are appropriate to the intended users/beneficiaries.** In deciding which new technologies are appropriate for particular users, the main consideration must be, what do they want? This includes technical as well as economic, social, cultural considerations of a given society and country. In this case, the women, specified that the rice flour mill they want should have the following features:
 - produces fine dry flour
 - high milling recovery
 - efficient and versatile
 - portable and lightweight, easy to transport within the village
 - easy to fabricate locally using durable materials
 - requires low inputs and maintenance
 - has low power requirement
 - generates income
 - easy to operate and maintain by a woman
 - affordable for purchase by a small organization
- b) **Provide potential women machine operators with "hands - on" training on the operation and simple trouble shooting of the machine.** These skills should be an integral part in the technology development process. If given proper training and skills, women can operate light machinery. Moreover, women should have access to private machinery manufacturers where repair and maintenance services are accessible.
- c) **Help women to formally organize themselves.** Often women in a group are more empowered as individuals. By working as a group, they can develop their own arrangements in managing and sustaining new technologies. They can have full control of the technology and provide custom services.
- d) **Foster close collaboration between social scientists and agricultural engineers.** Gender specialists should work closely with agricultural engineers and focus on technology questions as well as on gender

issues. Social scientists can play a pivotal role in bridging the gap between the technology generator and the client.

- e) **Use a gender sensitive participatory approach and community based technology transfer with the involvement of the men and women in each stage of the research process.** Include participants in each stage of hypothesis testing, planning, design, and evaluation. Women's knowledge, preferences, and feedback are necessary for a proposed technology to fit its niche, or to identify the niche for which technology is needed. Husbands should also be involved to provide support to their wives.
- f) **Target for full capacity utilization of the machine for economic viability.** Due to the seasonality of rice supply and use of rice flour, the full capacity of the mill was not attained. Members of the association or leaders should promote different marketing schemes to fully utilize the machine.

Nomenclature

Kg/ha - kilogram per hectare

Kg/hr - kilogram per hour

Kw - kilowatt

Mm - millimeters

T/ha – tons per hectare

Table 1
Characteristics of the Tampac II-III, Guimba, Nueva Ecija, Central Luzon

Distance to the town	7 kms
Total number of households	125
Farming	90
Landless	10
Total number of farmers	
Owner-cultivator	62%
Tenants	38%
Total rice area	187 has (partially irrigated)
Wet season	72%
Dry season	28%
Modern varieties (90-100 days)	PSBRC18, PSBRC60, PSBRC54
Average rice yield	3.5 tons/ha
Dominant pattern	Rice - Fallow; Rice - rice (for those with supplementary irrigation)

Table 2
Socioeconomic Characteristics of Women Participants in the Evaluation of the
Performance of Rice Flour Mill

Characteristics	
Total number of farming households	125
Number of women participants	40
Average age (years):	
Wife	42
Husband	44
Education level (no. of years):	
Wife	7.6
Husband	7.8
Average family size	5
Size of cultivated land holdings (has.)	
Owned (%)	
Up to 1.0	73
1.01 to 2.0	17
2.01 & above	10
Rented (%)	
Up to 1.0	83
1.0 to 2.0	15
2.01 & above	
Average farm size (has.)	1.5
Major source of income (%)	
Agriculture	93
Trade	7

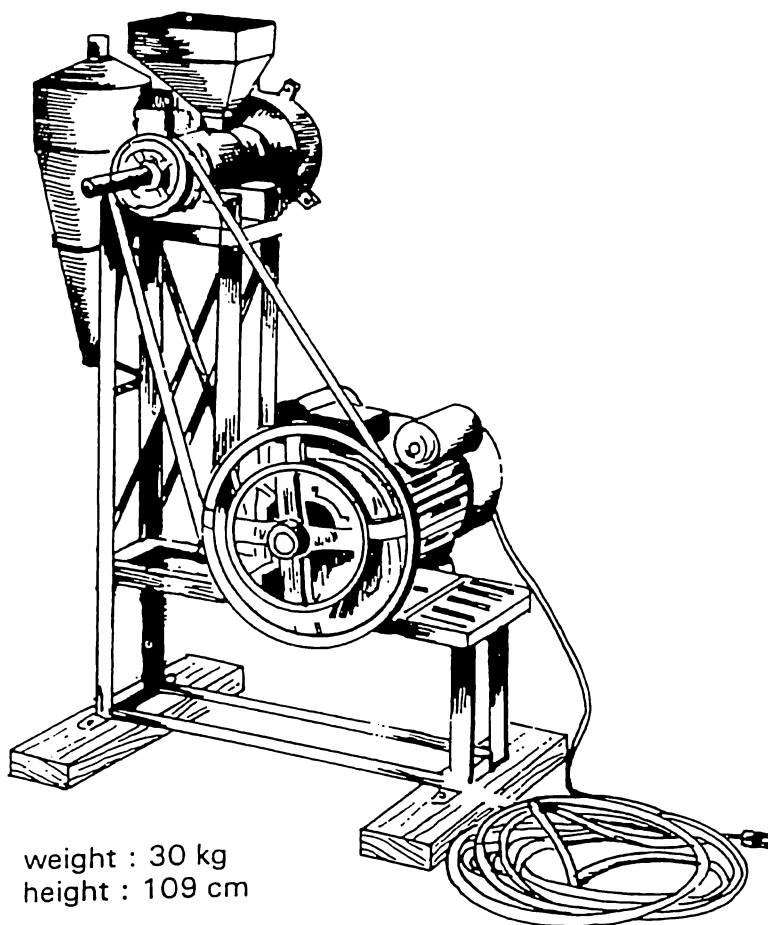
Table 3.
Field performance of rice flour mill and benefits derived by the women, Guimba, Nueva
Ecija, Philippines, 1998-2000.

Performance	1998	1999	2000	Total
Volume of rice processed (kg)				
January – March	-	204	110	314
April- June	-	227	106	333
July – September	26	3118	80	417
October-December	362	625	160	1147
Total	388	1367	216	2211
Benefits				
Costs of processing (₱/kg)	6.0	6.0	10.0	
Gross income (₱)	2,328.0	8,202.0	4,560.0	15,090.0
Operator's share (₱) ¹	931.2	3,280.8	1,824.0	6,036.0 ⁴
Cost of electricity (₱) ²	465.6	1640.4	912.0	3018.0
Net income to the association (₱) ³	931.2	3,280.8	1,824.0	6,036.0
Capacity of the rice flour mill – 23,041 kilograms/year⁵				
¹ 40% of gross income				
² 20% of gross income				
³ 40% of gross income (share of women's association)				
⁴ With estimated earning of 27 pesos/hr (based from the total quantity of rice processed, 2211 kilograms, and capacity of machine, 10 kg/hr)				
⁵ Based on 10 kg/hr capacity of machine; 8 hours/day operation; 24 days/month; 12 days/year				

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The authors are: Gender Specialist-Coordinator of the Gender in Rice Research and Technology Development Project and Assistant Scientist, respectively of the Social Sciences Division, DAPO 7777, Metro Manila, Philippines and Agricultural Engineer, PhilRice, Munoz, Nueva Ecija, Central Luzon, Philippines.



weight : 30 kg
height : 109 cm

- | | |
|----------------------|-------------------|
| 1. hopper | 3. rotor chamber |
| 2. cyclone separator | 4. electric motor |

Source: Rice Technology Bulletin, 1994 No. 5
Department of Agriculture, PhilRice

Figure 1. PhilRice Flourmill (Household Model)



Figure 2. Women farmer with agricultural economist discussing the features of the rice flourmill.



Figure 3. Women farmer testing and evaluating the rice flourmill in Tampac, Nueva Ecija, Philippines