

Impact Evaluation of Mechanized Tiger Grass Postharvest Technology in Banton, Romblon using General Systems Theory Model

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Abstract

This impact evaluation of the mechanized tiger grass (*Thysanolaena latifolia*) postharvest technology in Banton, Romblon focused on 1) participants' characteristics, social functions, physico-economic profile, and technology advocacy; 2) machine characterization in terms of gender and development, technological aspect, institutional and socio-economic impacts; and 3) machine's areas for improvement. Using sequential purposive sampling, data from stakeholders were gathered and analyzed. Focused group discussion was done to validate the feedbacks and gather recommendations. Findings revealed that most participants were females, above 31 years old, high school graduates, with families of 5-8 members. Both fathers, mothers and youths/children were involved in Masikap Farmers Association. For about five years, they participated in tiger grass industry as farm owners, farmers, laborers, processors and broom makers earning less than 5,000 pesos monthly. They supported adoption of mechanization technology and attended related trainings. The characteristics of the machine satisfactorily met gender and development requirements, technological aspects, institutional impact as well as socio-economic impact to people organization. Enhancement of the design and specification of the cleaner unit is recommended to increase output. A portable pedal-operated type of the device may be designed for the same purpose. Similar researches can be conducted to include more stakeholders in the region.

Keywords— Gender and development, Impact evaluation, Tiger grass pollen-remover machine, Post-harvest technology

INTRODUCTION

Infusing a new technology in an organization is like throwing a stone into a quiet still water in a pond. From the point of impact, concentric ripples move without bound sweeping the water surface and cause every water element to move. Such is similar when a technology is introduced to a farm level industry, it shall affect the whole system. According to [1], when an innovation is adopted into a farming system, it sets off a chain of reaction affecting the surrounding environment. Such innovation creates impacts which [2], described as “positive and negative,

primary and secondary effects produced by a development intervention, directly or indirectly.”

Many upland communities in the Philippines are engaged in production of tiger grass (*Thysanolaena latifolia*) as a source of household income, particularly in Nueva Ecija [3] and Romblon [4]. According to [5] tiger grass is harvested only once a year in these places; and most of the framers get their income mainly in tiger grass farming alone and some few doubled to farming and processing [6]. The study of [7] estimated around 400 hectares of land in

Romblon are planted to tiger grass primarily because of its economic potentials as a raw material for soft broom. The families are engaged in tiger grass production, trading the grass, processing the grass into soft brooms, and trading of the brooms. Technology intervention plays a very important role in increasing the income of tiger grass farmers in the hilly places in Calatrava, San Andres and San Agustin (CALSANAG) and Banton.

The Romblon State University through the College of Engineering and Technology (CET) developed Tiger Grass Pollen-Remover Machine (TGPRM) that would help tiger grass farmers in processing their product. The Department of Science and Technology and the Department of Trade and Industry are the partners of the University in transferring technology to the community. Under the CET Extension Program, information dissemination and demo on the operation of TGPRM paved the way for popular adoption of the machine in San Andres, Romblon. A memorandum of agreement was signed to establish shared service facilities in selected areas. There were four organizations that benefitted the program. A total of 12 TGPRM were distributed in the province as development intervention.

After about five years of initial adoption of the TGPRM, impact evaluation could be conducted as regards the technology infusion in said communities. Technology adoption brings about resultant changes in technological, social, institutional and economic condition of adopters. Moreover, there might be corresponding changes in attitudes, beliefs, values and behavior in the long run [1], and effect on gender and development. Since adopters of the TGPRM are in place, there is a need to measure the impact of using the machines to mechanize the postharvest practices on tiger grass industry.

A. Theoretical and conceptual Framework

General Systems Theory (GST) model was used as the basis to illustrate how the use of TGPRM as a system interacts with its environment. The idea is exemplified by Parson Equilibrium theory which states that changes in one aspect of society

require adjustments in other aspects. It demonstrates that the parts of a society's social structure are interdependent. This theory was used by [1] in impact assessment of utilization of an improved Maize Sheller in the major maize-producing provinces in Mindanao.

The conceptual framework (Fig.1) of the study follows the input, process, output (IPO) model. The input

includes the personal characteristics of participants in terms of age, sex, civil status and education; social function in terms of role in the family, involvement in organization and

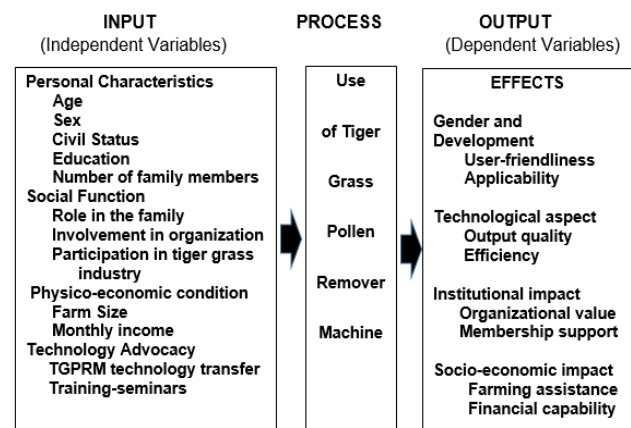


Fig.1 Conceptualized Relationship of Variables

participation in tiger grass industry; physico-economic condition in terms of farm size, luyaw harvest and monthly income; and technology advocacy in terms of TGPRM transfer and training-seminars. The process involves use of tiger grass pollen remover machine whereas the output includes effect on gender and development in terms of user-friendliness and applicability; technological aspect in terms of quality of output, and efficiency of the machine; institutional impact in terms of organizational values and membership support; and socio-economic impact in terms of farming assistance and financial capability.

B. Objectives

The study aimed to answer the following:

1. What is the profile of participants as regards
 - 1) Personal characteristics in terms of age, sex, civil status, and educational attainment;
 - 2) Social function in terms of role in the family,

involvement in organization, and participation in tiger grass industry; 3) Physico-economic status in terms of tiger grass farm size, tiger grass harvest per season, and monthly income; 4) Technology advocacy in terms of TGPRM technology transfer, and trainings and seminars.

2. How do machine adopters characterize the operation of the TGPRM in terms of the following: 1) Gender and Development; 2) Technological aspect; 3) Institutional impact; and 4) Socio-economic impact.

3. What are the stakeholders' feedbacks and recommendations as regards the use of the TGPRM?

MATERIALS AND METHODS

The study employed descriptive evaluative research strategy using GST model as the basis to illustrate how the use of TGPRM as a system interacts with its environment which views a system as a set of interrelated parts that function as a whole to achieve a common purpose described in Parson Equilibrium theory [1]. Through the help of the Department of Trade and Industry, the list of would-be participants was made. The sequential purposive sampling strategy was observed [8] among the participants in a meeting in the selected Barangay. The Filipino version of the validated survey instrument was used to gather information; it employed a four-point scale to characterize the machine like: 1- Poor (failed to meet user's requirements), 2- Fair (needs some improvements to meet user's requirements), 3- Satisfactory (meets user's requirement), and 4- Very satisfactory (exceeds user's requirements for optimum quality). Data were collected for the inputs such as feedback from the external environment (stakeholders) of the machine and the outputs in terms of effects in gender and development, technological aspects, institutional and socio-economic impacts. Conduct of focused group discussion (FGD) was done to validate the data and to gather recommendations about the use of the TGPRM. The data were collated and submitted to statistics expert for analysis.

RESULTS AND DISCUSSION

On the Participants' Personal Characteristics

The personal characteristics of the participants (Table 1.1) show that most (75%) of them are female and 25% are male. Majority (90%) are above 31 years old while same 5% are 21-25 years old and 20 years and below.

As to civil status, 75% of the participants are married, 10% are single and 15% are widow. Majority (95%) are high school educated while 5% college. In terms of number of family members, majority (75%) have 5-8 members while 25% have 4 and below.

On the Participants' Social Function

Regarding the social function (Fig.2) of the participants, 15% of them are fathers, majority (75%) are mothers and 10% are youths. The 75% are members while 25% are officers of the luway association (Masikap Farmers). This means that women and youths were also involved in tiger grass post-harvest technology and in people organization. For this, the participants possess high motivation and sense of responsibility and commitment in the association according to [3]. Such findings would have addressed the recommendation of [4] that tiger grass farmers in the area should be reorganized and a comprehensive plan for the tiger grass industry including soft broom processing be prepared.

As regards participants' involvement in luway industry (Fig.3), 65% are farm owners, 70% are farmers, 45% are laborers, 55% are broom makers and 85% are processors. According to the Provincial Science and Technology Center, the municipalities of San Agustin, Calatrava and San Andres are identified as luway production areas in Romblon. The present study supports Banton as luway producing area in the province.

Table 1.1 Personal characteristics of the participants in the Banton, Romblon

A. Gender	Frequency	Percentage
Female	15	75
Male	5	25
Total	20	100
B. Age		
20 and below	1	5
21-25	1	5
26-30	0	0
31 and above	18	90
Total	20	100
C. Civil Status		
Single	2	10
Married	15	75
Widow	3	15
Total	20	100
D. Education		
College	1	5.00
High School	19	95.00
Total	20	100
E. Number of family members		
4 and below	5	25.00
5 to 8	15	75.00
9 and above	0	0.00
Total	20	100

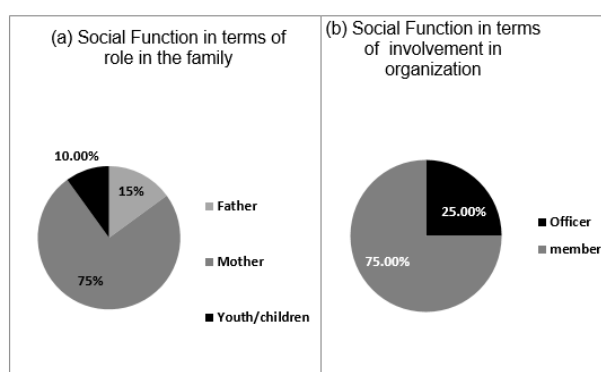


Fig.2 Participants' Social function in terms of (a) role in the family and (b) involvement in organization

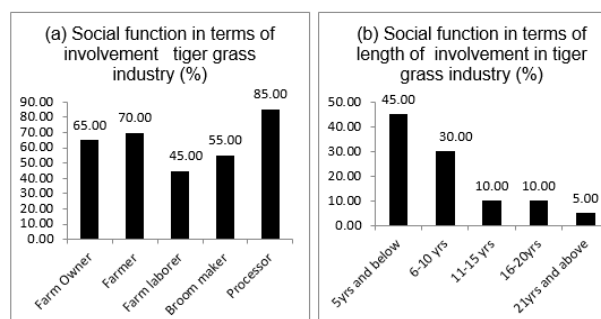


Fig.3 Participants' Social function in terms of involvement and length of involvement in luway industry

As regards length of involvement in tiger grass industry, most (45%) were in the industry for 5 years and below; 30% were 6-10 years, the same 10% were 11-15 and 16-20 years, while 5% were over 20 years. This findings supported [4] who reported that tiger grass farming and production is already a long time economic activity in Romblon especially in Marigondon Norte, San Andres, 86% of the tiger grass farmers get their income mainly in tiger grass farming alone and the remaining 14% doubled to farming and processing. The present study noted that Banton

is not comparable with other municipalities in terms of luway industry maturity.

For the physico-economic profile (Table 1.2) of the participants, 35% has less than 1 hectare, whereas 65% has 1-3 hectares. For the harvest per season, 50% have less that 50 bundles, 35% have 50-75 bundles while 15% have 100 bundles and more.

Table 1.2. Profile of the respondents in terms of Physico-economic status

A. Farm Size (ha)	Frequency	Percentage
Less than 1	7	35.00
1-3	13	65.00
More than 3	0	0.00
Total	20	100
B. Luway harvest per season (bundle)		
Less than 50	10	50
50-75	7	35
76-100	0	0
100	3	15
Total	20	100
C. Monthly income		
Below 5,000	19	95.00
5,000-15,000	1	5.00
16,000-25,000	0	0.00
25,000 and above	0	0.00
Total	20	100

Table 1.3 Profile of the participants in terms of technology advocacy

A. TGPRM Transfer	Frequency	Percentage
Advocates acquisition of TGPRM	20	100
Opposes acquisition of TGPRM	0	0
Total	20	100
B. Training-seminars		
Participant in TPRM training-seminars	20	100
Not participant in training-seminar	0	0
Total	20	100

This means that the participants have not much area for tiger grass farming. This relates to [6] who reported that in Romblon two municipalities are identified as a major producers of tiger grass, the municipalities of San Agustin and San Andres. However, the present study attests that such data does not include Banton, Romblon which is a separate island.

As regards monthly income, most (95%) of the participants have below Php5,000 while 5% have Php5,000-15,000. According to [4], the approximate income in tiger grass farming in the area ranges from Php 2,500 to Php 130,000 with an average income of Php 20,500 per farmer annually in Marigondon Norte, San Andres, Romblon. In the interview conducted, the participants emphasized that luway livelihood may be encouraged among the constituents if

good production and post-harvest facilities are available.

Considering the technology advocacy of the participants (Table 1.3) in terms of TGPRM technology transfer, 100% showed motivational effort in acquiring the machine from the Romblon State University through the shared service facility program of the Department of Trade and Industry (DTI). Also, 100% attended seminar and training demonstration in the use of the TGPRM. This means that the participants were all out support to the post-harvest technology of luway, a positive response to the recommendation of [4] that mature tiger grass technologies be introduced, validated and transferred in the area. According to [3], increase in the level of person's involvement in organizations will enhance profitability, productivity, and market share; and such involvement is associated with organizational effectiveness.

On Participants' Characterization of the TGPRM

Considering the participants' characterization on the use of the TGPRM in terms of its effect on gender and development (Table 2.1), findings showed a mean of 3.2 for the indicator "The machine is easy to operate and applicable for use by women" which is described as *satisfactory*. Likewise, a mean of 3.2 for the indicator "The machine is easy to operate and applicable for use by youths" described also as *satisfactory*. An average mean of 3.2 was obtained in this section described as *satisfactory*.

Table 2.1. Characterization on the use of TGPRM in terms of effect on gender and development

Indicators	Wm	Gap	SD	Descript
1.The machine is easy to operate and applicable for use by women	3.2	0.8	0.616	Satisfac
2.The machine is easy to operate and applicable for use by youths	3.2	0.8	0.616	Satisfac
Average	3.2	0.8	0.616	Satisfac
Legend: Weighted mean (Wm) Description (D)				
3.26-4.0 Very Satisfactory (meets and exceeds user's requirement)				
2.6-3.25 Satisfactory (meets user's requirements)				
1.76-2.5 Fair (needs some improvement to meet user's requirements)				
1-1.75 Poor (fails to meet user's requirements)				

This implies that, although TGPRM meets the requirements of women and youths about its use, there is a gap of 0.8 towards very satisfactory

rating in terms of gender and development. According to Mishra (2016), it is generally felt that the available agricultural technologies are not women friendly as they are not designed taking into consideration the women's ergonomic measurements. There exists a gap between design engineers and farm planners and also the lack of women's access to articulate their felt needs. Further, [9] established that farming equipment is traditionally designed to be used by men. That presents a problem for the increasing number of women across the country who are entering the agriculture workforce. Further, Men have long dominated the farming world. So farm equipment is largely designed to be used by male farmers; and female-friendly tools are hard to come by.

As regards characterization of TGPRM in terms of its effect on technological aspects (Table 2.2), it obtained a *satisfactory* rating with 3.0 average weighted mean. All the indicators "The output tiger grass of the machine is clean", "There is more number of cleaned tiger grass using the machine", "The output tiger grass of the machine is well arranged and of good quality" and "It is easy to transfer and position the machine" equally got *satisfactory* rating. A gap of 1.0 towards *very satisfactory* rating was observed in this area; which implies that although the technological aspects of the machine meets the users' requirements, still there are features for improvement to meet and even exceed users' requirements most particularly in terms of ease to transfer and position the farm equipment.

According to [2] an impact evaluation should provide information about the technological impacts produced by an intervention. About this, [7] said that the machine has four major components, the pollen remover assembly, the power unit, the machine frame or support, and the wood lathe assembly. The power unit consists of an electric motor, v-belt and pulley. The electric motor having a shaft pulley of three (3) inches transmits power from the electric motor to the 1inch pollen remover shaft. Also, [10] emphasized that preparation of inventory of women friendly equipment includes their functions, specifications, brief description,

benefits/ advantages and source of availability. It is presumed that introduction of women friendly improved farm tools and equipment can reduce drudgery of farm women in field operations if promoted among them.

Table 2.2. Characterization on the use of TGPRM in terms of its effect on technological aspects

Indicators	Wm	Gap	SD	Description
1. The output tiger grass of the machine is clean.	3.20	0.80	0.52	Satisfactory
2. There is more number of cleaned tiger grass using the machine.	3.05	0.95	0.39	Satisfactory
3. The output tiger grass of the machine is well arranged and of good quality.	2.95	1.05	0.60	Satisfactory
4. It is easy to transfer and position the machine.	2.80	1.20	0.69	Satisfactory
Average	3.00	1.0	0.34	Satisfactory
Legend: Weighted mean (Wm) Description (D)				
3.26-4.0 Very Satisfactory (meets and exceeds user's requirements)				
2.6-3.25 Satisfactory (meets user's requirements)				
1.76-2.5 Fair (needs some improvement to meet user's requirements)				
1-1.75 Poor (fails to meet user's requirements)				

Table 2.3. Characterization on the use of TGPRM in terms of its institutional impact to people organization

Indicators	Wm	Gap	SD	Description
1. The tiger grass livelihood program in the Barangay is encouraged.	2.90	1.10	0.64	Satisfactory
2. The association employs members in the farm during financial shortage.	2.80	1.20	0.61	Satisfactory
3. The association conducts trainings, seminars and sponsors different activities for the members.	2.55	1.45	0.75	Satisfactory
4. The association helps provide ways and means for the water requirement of farmers.	2.25	1.75	0.78	Fair
5. Motivates people to engage in farming and increase tiger grass production.	2.70	1.3	0.57	Satisfactory
Average	2.64	1.36	0.47	Satisfactory
Legend: Weighted mean (Wm) Description (D)				
3.26-4.0 Very Satisfactory (meets and exceeds user's requirements)				
2.6-3.25 Satisfactory (meets user's requirements)				
1.76-2.5 Fair (needs some improvement to meet user's requirements)				
1-1.75 Poor (fails to meet user's requirements)				

About institutional impact to people organization (Table 2.3), it obtained *satisfactory* rating with 2.64 average weighted mean. Four indicators obtained *satisfactory* rating which are “The tiger grass livelihood program in the Barangay is encouraged”, “The association employs members in the farm during financial shortage”, “The association conducts trainings, seminars and sponsors different activities for the members” and “Motivates people to engage in farming and increase tiger grass production”. However, the indicator “The association helps provide ways and means for the water requirement of farmers” obtained a *fair* rating with mean of 2.93. The weighted mean (2.64) has a gap of 1.36 towards *very satisfactory* rating. This implies that there are still features needing improvement towards exceeding users' requirements. According to [11], Farmers'

associations play an important role to help members increase their access to supports of information, capital, and technology; bring benefits to members; and partly promote production, and increase income. The farmers, who are members of an association, are more helpful in the ability to access better market services.

In terms of its socio-economic impact to people organization (Table 2.4), it obtained *satisfactory* rating with 2.62 average weighted mean with a gap of 1.38 towards *very satisfactory* rating.

Table 2.4. Characterization of TGPRM in terms of its socio-economic impact to people organization

Indicators	Mean	Gap	SD	Description
1. The association helps sustain production input of the tiger grass farmers;	2.70	1.3	0.73	Satisfactory
2. Helps the farmers acquire needed equipment for farming;	2.70	1.3	0.81	Satisfactory
3. Coordinates with LGU's and other national agencies for economic assistance;	2.55	1.45	0.60	Satisfactory
4. Helps the farmers to market farm products specially tiger grass;	2.80	1.2	0.69	Satisfactory
5. Helps the farmers strengthen financial standing of the family;	3.05	0.95	0.51	Satisfactory
6. Aids in settlement of farm accountabilities and/or obligation of the families;	2.50	1.5	0.76	Fair
7. Provides additional source of income for households;	2.70	1.3	0.80	Satisfactory
8. Supports the farmers in sending their children to school;	2.55	1.45	0.51	Satisfactory
9. Helps the farmers acquire home appliances and vehicles;	2.40	1.6	0.88	Fair
10. Helps farmers to engage in small business.	2.25	1.75	0.91	Fair
Average	2.62	1.38	0.37	Satisfactory
Legend: Weighted mean (Wm) Description (D)				
3.26-4.0 Very Satisfactory (meets and exceeds user's requirements)				
2.6-3.25 Satisfactory (meets user's requirements)				
1.76-2.5 Fair (needs some improvement to meet user's requirements)				
1-1.75 Poor (fails to meet user's requirements)				

Table 2.5 Summary of participants' characterization on the use of TGPRM

Indicators	Wm	Gap	SD	Description	Rank
1. Gender and development	3.20	0.80	0.616	Satisfactory	1
2. Technological aspects	3.00	1.00	0.344	Satisfactory	2
3. Institutional impact	2.64	1.36	0.471	Satisfactory	3
4. Socio-economic impact	2.62	1.38	0.376	Satisfactory	4
Average	2.87	1.13	0.452	Satisfactory	
Legend: Weighted mean (Wm) Description (D)					
3.26-4.0 Very Satisfactory (meets and exceeds user's requirements)					
2.6-3.25 Satisfactory (meets user's requirements)					
1.76-2.5 Fair (needs some improvement to meet user's requirements)					
1-1.75 Poor (fails to meet user's requirements)					

The indicator “Helps the farmers strengthen financial standing of the family” obtained the highest rating of 3.05 while indicator “Helps farmers to engage in small business” obtained the lowest rating with a mean of 2.25. The average gap of 1.38 towards *very satisfactory* rating implies that the TGPRM although meets the requirements in terms of socio-economic impact to people organization, there are still features needing improvement towards exceeding users' requirements. According to the

DTI, performance of micro, small and medium enterprises (MSMEs) is constrained by various factors such as limited financial capacity, poor market information and lack of access to innovative techniques and advanced technology which hinder them to realize their full potential, break into bigger domestic or international markets, and grow in a highly competitive environment.

Summary of participants' characterization on the use of TGPRM (Table 2.4) reflects that all the indicators obtained a *satisfactory* rating with 2.87 average weighted mean and 1.13 gap towards meeting and exceeding the users' requirements. When ranked from highest to lowest, the first is "gender and development" then "technological aspects", "institutional impact" and last is "socio-economic impact". This means that the most needed improvement on machine characteristics pertains to the socio-economic impact to people organization.

Along this line, monitoring is essential among the machine adopters through the association. According to the DTI, the Shared Service Facility Project is meant to improve micro, small and medium enterprises (MSME) competitiveness by providing machinery, equipment, tools, systems, accessories and other auxiliary items, skills and knowledge under a shared system. It should help target beneficiaries increase their production capacities and improve product quality, resulting to increased markets, increased sales, and jobs generation.

On feedbacks and suggestions as regards the TGPRM

For the participants' comments and suggestions as regards the use of TGPRM (Table 3), the strengths are "The TGPRM has good cleaning quality; very helpful in making "walis tambo" of the luway farmers" and "The machine is safe to operate by women and youths/children, no problem about safety". For the areas needing improvement, suggestions are "Review of the design is suggested to increase volume of production", "A smaller and portable machine using pedal to operate is suggested", "The local government may consider providing additional machines to increase the production of the

people organization", and Provide other facilities for tiger grass livelihood in the area".

Table 3. Feedbacks and suggestions about the TGPRM during focused group discussion

Strengths
1. The TGPRM has good cleaning quality; very helpful in making "walis tambo" of the luway farmers.
2. The machine is safe to operate by women and youths/children, no problem about safety.
Areas Needing Improvement
1. The machine cannot produce large volume of cleaned tiger grass needed for the finished product.
2. The machine is heavy and difficult to transfer.
3. One machine is not enough for all the farmers, additional units are needed.
4. It lacks good facilities for luway livelihood.
Recommendations
1. Review of the design is suggested to increase volume of production.
2. A smaller and portable machine using pedal to operate is suggested.
3. The local government may consider providing additional machines to increase the production of the people organization.
4. Provide other facilities for tiger grass livelihood in the area.

CONCLUSION

The characterization of the adopted Tiger Grass Pollen Remover machine in the municipality adequately meets the requirements in terms of gender and development, effect on technological aspects, institutional impact to people organization and socio-economic impact to people organization; although there are still features needing improvement to increase production output. Users preferably suggest a portable pedal-type version of the machine; thus conduct of relative researches is recommended.

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