ORIGINAL ARTICLE

COMMON CHARACTERISTICS OF PROGRESSIVE DAIRY BUFFALO FARMERS IN NUEVA ECIJA, PHILIPPINES

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ABSTRACT

The study was conducted to document and analyze the common traits of progressive dairy buffalo farmers (PDBFs) in Nueva Ecija in terms of socio demographics, technology adoption practices, personal entrepreneurial competency (PEC), personal communication network, income from buffalo dairying and problems encountered in their dairy enterprise. Face-to-face individual interviews with 47 PDBFs were made using semi-structured questionnaire and PEC score sheet. Results showed that majority of PDBFs were maintaining at least five female dairy buffaloes and were categorized as belonging to the "earlier adopter" group either as innovators, early adopters, or early majority. Most of the PDBFs also showed commonalities in terms of age, education and dairy husbandry practices. Depending on their level of operation, they have varying asset values but all have positive net incomes derived from dairy buffalo production. They are also "moderately competent" as entrepreneurs following the PEC rating. Using linear regression analysis, the "number of dairy cows" regressed positively while the "cost of inputs" regressed negatively with the "income from dairying". Common problems encountered by the PDBFs include frequent fluctuation in the price of raw milk, seasonal supply of fresh fodder, and inadequate technical competency. It is recommended that the PDBFs undergo refresher trainings to further hone their knowledge and skills and become communicators of technologies themselves to benefit other dairy buffalo farmers.

Keywords: dairy buffalo, Nueva Ecija, progressive farmers, technology adoption

INTRODUCTION

The entrustment of purebred dairy buffaloes by the Philippine Carabao Center (PCC) to smallholder-farmers in Nueva Ecija, which started in the late 1990s, is a development intervention akin to introducing an innovation in a traditional farming system. This is because the said farmers were not used to managing purebred buffaloes for milk. Instead, they are more familiar with raising native carabaos for draft purposes. As a result, there have been varying observations as regards the outputs or outcomes of the said intervention and/or its accompanying innovations. At the level of the individual farmers, an observable outcome can be represented by the changes in their knowledge, skills, attitude, and socio-economic conditions. As a consequence, there are those who are labeled as progressive dairy buffalo farmers (PDBFs) in the sense that they have become successful in their dairy buffalo operations. Others were not as successful, and have stopped raising dairy buffaloes for some reasons.

While the PCC has an informal roster of PDBFs at least in Nueva Ecija, the basis

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for categorizing them as such is not very clear. For one, there has been no deliberate attempt to document their unique or common characteristics, except, to some extent, during the agency's annual search for outstanding dairy buffalo farmers. Still, the basis for the latter is more on the visible output of the farmer's operations (*e.g.*, number of lactating animals, level of milk production, income from dairy operations), and not on their personal attributes. The current research aims to look into the latter with a proposition that progressive farmers share common personal characteristics that influence how they make decisions as regards their engagement in dairy buffalo production. Understanding of which will guide the PCC in its own decision-making processes in the course of engaging with the farmers.

This study was guided by the following objectives: 1) determine the personal characteristics exhibited by and circumstances surrounding the PDBFs in Nueva Ecija; 2) determine any relationship between the farmers' personal characteristics or circumstances and their income from dairying; and 3) identify any issues or concerns encountered by the PDBFs in their operations and how to address them.

MATERIALS AND METHODS

The research was guided by the basic concepts and theory of "diffusion of innovation" (Rogers, 2003) particularly on how the adopters are categorized, i.e., as innovators, early adopters, early majority, late majority, and laggards. PDBFs are perceived here to belong to the "earlier adopter" groups, *i.e.*, either as innovators, early adopters or early majority. They are the focus of many agricultural extension efforts in many parts of the world because they help facilitate the proliferation or diffusion of innovations. This is despite the critiques by some scholars (Roling *et al*., 1976) that the "progressive farmer strategy" contributes to the widening of gap between the more knowledgeable, more innovative, more economically endowed and the "less" progressive ones who are situated at the other end of the spectrum.

Notwithstanding the issue on inequality (Roling *et al*., 1976), the PDBFs are viewed here to play a pivotal role in the success of the dairy buffalo program in Nueva Ecija. For one, buffalo dairying necessitates special type of management practices that require investments, resources and technology utilization. It is postulated that progressive farmers possess particular attributes that will support or complement these requirements. Key attributes (independent variables) include socio-demographics, technology awareness and adoption practices, personal communication network and personal entrepreneurial competency, among others. The same attributes and circumstances surrounding the progressive farmers are seen here to be associated with the performance indicators related to their dairy buffalo production, more particularly the income that they generate from dairying (dependent variable). Figure 1 shows the relationship between the independent and dependent variables.

The research team conducted face-to-face individual interviews with 47 PDBFs in Nueva Ecija using a pretested semi-structured survey questionnaire and a modified version (Orden *et al*., 2013) of Personal Entrepreneurial Competency (PEC) rating sheets (Mansfield *et al*., 1987). These farmers were pre-selected by the National Impact Zone Program Coordinating Unit (NIZPCU) based on their status as "still actively practicing buffalo dairying" since the time a purebred buffalo cow was entrusted to them by the PCC. Survey results were analyzed using descriptive statistics. Focused group interviews were

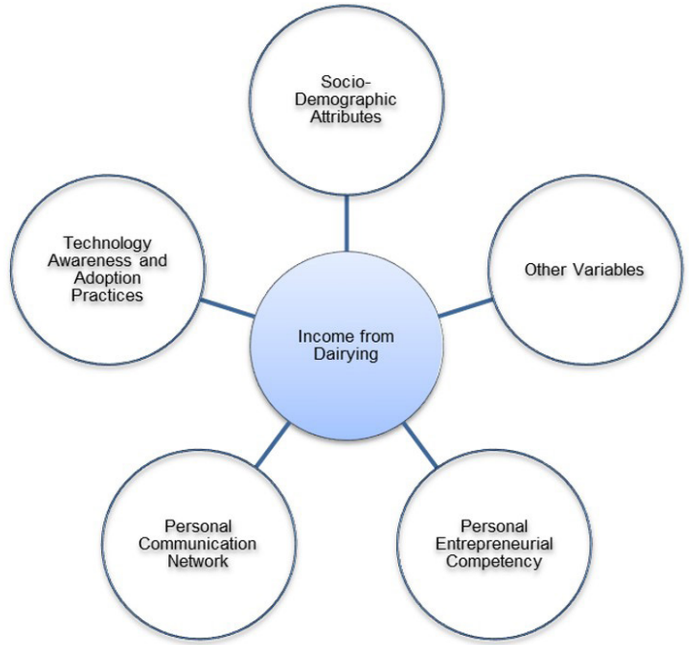

Figure 1. Relationship between dependent (shaded circle) and independent variables (unshaded circles).

also conducted with the NIZPCU and colleagues of particular PDBFs to generate baseline information on how they would describe the latter as a dairy buffalo farmer.

Pearson correlation and regression analyses were also made to see if there are linear associations between the mean income from dairying as dependent variable and the following independent variables: 1) age; 2) income from other sources; 3) cost of inputs; 4) number of dairy cows; 5) years of formal educational; 6) number of trainings attended; 7) number of technologies adopted; 8) number of hours devoted to dairying; 9) number of alters (a measure of cosmopoliteness); 10) personal entrepreneurial competency rating; and 11) number of years in raising dairy buffalo. The data were encoded and analyzed using MS Excel 2010 and SPSS Version 17.

RESULTS AND DISCUSSION

Personal Characteristics

Socio-demographic traits

Majority of the identified PDBFs were males, married, belonging to households with an average size of four, and most have reached college and secondary education. The PDBFs were also in their late adulthood stage (average age of 51 years) but were still considered productive as they were still managing their mutually beneficial sources of income, which were rice farming and buffalo raising.

Dairy buffalo production management system

Management Practices. The PDBFs started with a total animal inventory of 84 carabaos, which were raised mainly for draft and breeding purposes. Upon receiving the purebred dairy buffaloes from PCC in 1999, the PDBFs increased their inventory of buffalo cows by 405.36%, the heifer by 386.67%, senior bulls by 250%, junior bulls by 3400%, and calves by 8850%, as of June 2014 (Figure 2). The observed increase can be attributed to successful animal breeding, proper feeding and nutrition, health management and patronage of PCC's technical services channeled through the local government units (LGUs) and established dairy producers' cooperatives.

Those who were classified as commercial/semi-commercial raised the highest number of female buffaloes followed by those under family module and smallhold categories. All PDBFs raised their animals for dairying and breeding purposes and were usually fed with napier grass, rice straw and combinations of forages that were frequently sourced from communal areas. These activities add up to the years of experience of the 47 PDBFs in raising dairy buffaloes. Such "good practices" in production management relate well with those listed by FAO and OIE (2010). Other practices exhibited by PDBFs include dedication and willingness to learn and application, adoption and dissemination of the new technologies diffused mainly by the PCC and other sources.

Assets and Income. On the average, a PDBF owns less than a hectare of land used for forage production, animal shed and crop farming. Total capital investments were allotted mostly on farm equipment, followed by housing and fences and farm tools. Average asset values in raising dairy buffaloes for PDBFs under smallholder, family module, and semi-commercial/commercial categories were PhP6,277.72, PhP7,592.20, and PhP157,254.25, respectively. In general, all categories of PDBF have positive net revenues in CY 2013 (Table 1).

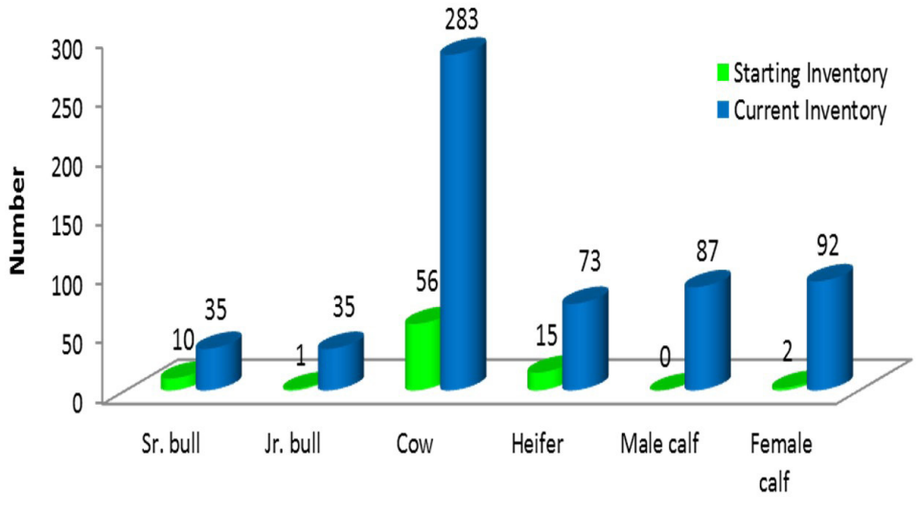

Figure 2. Total animal inventory in the care of progressive dairy buffalo farmers in Nueva Ecija.

Table 1. Simple cost and return analysis per dairy farm in peso in year 2013, Nueva Ecija.

Particular	Small-hold (N=9)	Family module (N=18)	Commercial/ Semi-commercial (N=3)	All (N=30)
Income	234,869	429,705	1,499,298	491,714
Cash income[1]	74,869	159,705	784,298	196,714
Non-cash income[2]	160,000	270,000	715,000	295,000
Expenses (inputs)	64,357	118,963	481,910	141,039
Cash[3]	34,784	75,426	401,370	98,518
Non-cash[4]	29,573	43,537	80,540	42,521
Net cash income	40,085	84,279	382,928	98,196
Net non-cash income	130,427	226,463	634,460	252,479
Total net income	170,512	310,742	1,017,388	350,675

1: income from selling milk and animals; 2: estimated value of animal stock; 3: Production inputs *e.g*. feeds, vet. supplies, hired labor and fuel; 4: family labor and tools/equipment depreciation.

Labor utilization. The PDBFs commonly hired laborers in addition to the workforce provided by participating members in their respective families. The number of laborers to be hired depended on the number of animals raised by the PDBFs. Hired laborers helped them in collecting fodder for feeding, cleaning of corrals, bathing and milking of cows, housing maintenance and health management activities. They worked for an average of 4.7 hours daily and got paid at PhP1,657 a month. Family members who were engaged in dairy buffalo production usually exceed more than an hour of farm work compared to hired laborers. This ensures that every task is performed properly.

Participation in capacity development activities

Trainings and workshops participated in by the PDBFs were mostly in the areas of cooperative management, strategic planning, leadership enhancement, conflict management, dairy buffalo production and feeding management and business and financial management.

Achievements

Of the 47 PDBFs, 12 have received various awards like "best cow" for the most productive female buffalo in terms of milk yield, the "best dairy buffalo farmer" for family and semi-commercial categories, for having the first calf born within the NIZ, and for having served as resource speaker on buffalo production-related activities. They also participated in various educational field activities sponsored by the PCC.

PDBFs' "alters" or individuals in their personal communication network

The PDBFs often sought assistance when they faced technical problems in their dairy buffalo production. Most of them communicate with and ask for technical and support services from the PCC's NIZPCU because of their availability, accessibility and expertise

on the matter. Other providers of technical assistance are co-buffalo raisers, AI technician, LGU technician, provincial/municipal veterinarians and other private entities.

Technology adoption practice

Technology is the means and methods employed in the production of an output; installation, operation and maintenance of equipment, device, or industrial set-up; know-how, invention, discovery including the performance of skills and services (DOST as cited by Burgos and Perez, 1992). Most of the technologies applied by PDBFs for dairy buffalo production reached their awareness in 1999. It was the same year when PCC started the entrustment of imported buffaloes and required the eligible recipients to learn its technologies and to hone their skills in proper buffalo management through social preparation and technical trainings. Thereafter, the PDBFs tried and evaluated the technologies to weigh the advantages and risks involved. Except for early weaning, feeding with milk replacer, urea-treated rice straw and total mixed ration, all other technologies introduced by the PCC were continuously being adopted by the PDBFs (Table 2). The results imply that adoption of improved management technologies are prerequisites to a successful dairy buffalo production as experienced by the PDBFs. It also supports the idea postulated in the conceptual framework that PDBFs belong to the "earlier adopter" groups.

Table 2. Summary table of technology adoption by the progressive dairy farmers in Nueva Ecija, 2014.

Improved management practices		Heard		Tried		Adopted		Not adopted	
		No.	%	No.	%	No.	%	No.	%
Recording system		47	100	47	100	47	100	0	0
Herd management	Feeding with colostrum	47	100	47	100	47	100	0	0
	Early weaning (at birth)	47	100	0	0	0	0	0	0
	Feeding with milk replacer	47	100	1	2	0	0	1	100
Feeds and feeding	Legume supplementation	47	100	35	74	35	100	0	0
	Mineral supplementation	47	100	34	72	31	91	3	9
	Urea-treated rice straw	46	98	7	15	0	0	7	100
	Total mixed ration	42	89	1	2	0	0	1	100
	Cleaning the udder	47	100	47	100	47	100	0	0
Milking production	Foremilk stripping	47	100	47	100	47	100	0	0
	Dipping teats in iodine	47	100	45	96	41	91	4	9
	Milk cooling	44	94	10	23	9	90	1	10
Breeding	Estrus detection	47	100	47	100	47	100	0	0
Health	Vaccination	47	100	47	100	46	98	1	2
	Deworming	47	100	47	100	46	98	1	2

Personal entrepreneurial competency

Personal entrepreneurial competency (PEC) is an "underlying characteristic possessed by a person, which results in new venture creation, survival and/or growth" (Orden *et al*., 2013). Originally, the PEC test has three main clusters and ten basic PECs (Mansfield *et al*., 1987). This study adopted the modified PEC test by Orden *et al*. (2013), which only uses six appropriate PEC indices to characterize the behavior of the PDBFs. These competency indices which have direct implications on the performance of the PDBFs were: 1) opportunity seeking; 2) persistence; 3) demand for quality and efficiency; 4) risk taking 5) systematic planning and monitoring; and 6) self-confidence.

Across all classifications, the overall mean for PEC was 2.94, which falls under the description of "moderate entrepreneurial competency". The PDBFs scored highest in "persistence" followed by "opportunity seeking", "self-confidence", "systematic planning and monitoring", "demand for efficiency and quality" and ranked lowest in "risk taking" (Table 3). Such mean PEC rating implies that PDBFs are: 1) mentally attuned to face significant obstacles and moderately persistent in finding ways to overcome them; 2) occasionally looking and taking actions on opportunities that they believe have a high potential in improving and adding value to their production; 3) facing challenges and difficulties (*i.e*., competition, maintaining the quality of milk, animal mortalities, price fluctuations) with confidence in their own abilities bestowed to them by God; 4) able to plan by breaking down large tasks into small ones and effectively perform these tasks with allotted time; extra time is used for monitoring; 5) exerting mid-level focus in ensuring the

Table 3. Personal entrepreneurial competency of progressive dairy buffalo farmers in Nueva Ecija.

Personal entrepreneural competency	Mean rating			
	Small hold (N=18)	Family module (N=25)	Commercial/ Semi-commercial (N=4)	Overall (N=47)
Opportunity seeking	3.00	3.02	3.17	3.06
Persistence	3.06	3.11	3.04	3.07
Demand for efficiency and quality	2.87	2.96	3.04	2.96
Risk taking	2.44	2.53	2.50	2.49
Systematic planning and monitoring	3.01	2.94	3.08	3.01
Self-confidence	3.11	3.06	2.96	3.04
Mean	2.92	2.94	2.97	2.94
Description	Moderate	Moderate	Moderate	Moderate

Mean Rating	Description
3.67-5.00	High
2.35-3.66	Moderate
1.00-2.34	Low

efficient use of time and resources as well as processes and procedures for the agreed upon standards of quality; and 6) somehow concerned about the risks an undertaking would bring while sensibly evaluating other alternatives.

Linear correlation and regression tests

Of the 11 independent variables, only six were proven to have positive linear correlation with the income derived from raising dairy buffalo (Table 4). The six independent variables were:

a. *Age* – As the PDBFs grow older, they would acquire relevant experiences and wisdom on buffalo dairying; thus, they are expected to have increased income.
b. *Income from other sources* - It provides for the increased capacity of the farmers to purchase or provide inputs and adopt technologies necessary to sustain and improve their production.
c. *Cost of inputs* – The income spent to purchase inputs serves as investment. High cost of inputs implies that the farmer has high level of operation. Consequently, after inputs are used, higher potential income may be realized. This variable also often influences the rate and speed of growth by an enterprise.
d. *Number of dairy cows* – The PDBFs with significant number of healthy breeding and lactating buffalo cows are expected to get calves and higher volume of milk. Therefore, high volume of milk when sold implies higher dairy income.
e. *Number of technologies adopted* – The PCC, as the lead agency in the diffusion of dairy buffalo innovations, is confident that adoption of technologies is a significant component for the improvement of production; hence, increase in income among dairy farmers.
f. *Number of years raising dairy buffalo* - Experienced dairy farmers have acquired knowledge and have been exposed to various technologies and dairy production practices. Thus, the more years they spent in raising dairy buffalo, the more net income is expected.

Using backward stepwise regression method, two predictor variables were found to be significant, namely “cost of inputs” (t = -2.158, p = 0.043) and “number of dairy cows” (t = 4.828, p = 0.000) (Table 5). The “number of dairy cows” had the largest beta value (1.262) among the predictors; thus, had the largest impact on the “income from dairying”.

Table 4. Summary of correlation analysis.

Independent variables	Pearson correlation, r	Sig. (2-tailed), p
Age	0.410*	0.037
Income from other source	0.680**	0.000
Cost of inputs	0.725**	0.000
Number of dairy cows	0.840**	0.000
Number of technology adopted	0.401*	0.042
Years in raising dairy buffalo	0.446*	0.022

**Significant at the 0.01 level (2-tailed)
*Significant at the 0.05 level (2-tailed)

Table 5. Summary of regression analysis.

Variables	Unstandardized coeffi-cients		Standardized coefficients	t	Sig.	R^2	F-value
	Beta	Std. error	Beta				
(Constant)	-284068.905	87126.091		-3.260	0.004		
Age	3361.340	1808.904	0.190	1.858	0.077		
Cost of inputs	-0.524	0.243	-0.573	-2.158	0.043*		
Number of dairy cows	33973.779	7037.332	1.262	4.828	0.000**		
Years in raising dairy buffalo	6004.609	3072.421	0.199	1.954	0.064	0.811	22.480

Dependent variable: Income from dairying
**Significant at the 0.01 level (2-tailed)
*Significant at the 0.05 level (2-tailed)

In other words, controlling for other predictor variables in the model, an increase by one unit of a standard deviation in the “number of dairy cows” would increase the “income from dairying” by 1.262 of a standard deviation. The R^2 value was 0.811, which means that the regression model accounts for 81.1% of the variance in the “income from dairying”.

Problems encountered

Despite the success of the PDBFs, there were problems identified as follows:

Frequent fluctuation in the price of raw milk

Factors like farm location, means of transport, volume of milk and its high perishability put pressure on PDBFs to immediately sell their produce to accessible buyers even at a low price. Because of this, they tend to look for other market that could offer a higher price for their produced raw milk.

Supply of fodder

In the past, before the dairy farmers were granted with buffaloes, the PCC required them to develop 1,000 sq m of land to supply improved forage for the number of animals indicated in the contract. The PDBFs complied with this requirement but as their herd size grew, forage supply became insufficient. To address the problem on forage shortage, they would often wander in nearby towns to collect rice straws and other farm by-products, which are considered low quality feedstuffs.

Technical competency

Eight PDBFs expressed their need to be trained further on animal health-related management practices.

CONCLUSION

The term “progressive dairy buffalo farmers” can be described as those individuals who are early adopters of technologies and experienced buffalo raisers who invested

significant amount of money to establish a pool of productive and lactating herds that serve as their source of primary or secondary income. The PDBFs with "moderate entrepreneurial competency" rating are deemed to be persistent and resilient in times of difficulties experienced throughout the dairy production cycle.

In order to address the identified problems and utilize the commendable skills of the PDBFs in Nueva Ecija, the authors recommend the following: 1) conduct refresher courses following the "Farmer Livestock School" or FLS approach (PCAARRD, 2014) as applied to dairy buffalo production with hands-on training for the PDBFs with the main objective to enrich or hone further their knowledge and skills on the said topic; and 2) select qualified PDBFs as facilitators of FLS themselves and as communicators of technologies to bridge the gap between the sources of technologies (scientists) and the other dairy buffalo farmers in Nueva Ecija.

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REFERENCES

Burgos BM and Perez ML. 1992. *Technology Transfer and Commercialization Framework*. Staff Paper Series No. 17. PCAARRD, DOST, Los Baños, Laguna.

FAO and OIE. 2010. *Guide to Good Farming Practices for Animal Production Food Safety*. Accessed 2 June 2014. http://www.fao.org/3/a-i0482t.pdf

Mansfield RS, McClelland DC, Spencer Jr L and Santiago J. 1987. *The Identification and Assessment of Competencies and Other Personal Characteristics of Entrepreneurs in Developing Countries*. Accessed 2 June 2014. http://pdf.usaid.gov/pdf_docs/Pdaav866.pdf.

Orden MEM, Porciuncula FL, Aveno JL, Orden EA, Domingo IJ, Rafael Jr. PJ, Zapata Jr. NR, Del Rosario NA, Parayno RS, Francisco BE and Corales RM. 2013. *Impact Assessment of the Carabao Development Program of the Philippine Carabao Center*. Terminal Report.

Philippine Council for Agriculture, Aquatic, and Natural Resources Research and Development. 2014. *Facilitators' Guide to Farmer Livestock School on Goat Enterprise Management (FLS-GEM) Implementation* (Volume 1: Session Guides). Los Baños, Laguna: PCAARRD/DOST, 2014. 147p. – (PCAARRD Training Module Series No. 5/2014).

Rogers EM. 2003. *Diffusion of Innovations* (5th ed.). New York, NY: Free Press.

Roling N, Ascroft J and Wa Chege F. 1976. The Diffusion of Innovations and The Issue of Equity in Rural Development. In Melkote and Steeves (2nd. Ed.) *Communication for Development in the Third World: Theory and Practice for Empowerment*. New Delhi: Sage.