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Establishing a Viable Enterprise Using Free-Range Chicken Production Technology in Bataan

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Abstract

The study was conducted to establish a viable enterprise for 2 years funded by DA-ACEF which aims to increase production of F1s of free-range chicken, increase adoption of developed by Tarlac Agricultural University; and enhance capacity of beneficiaries. Six packages of technology were adopted both on-station and on-farm sites: FRC housing, FRC breeding, FRC brooding, FRC ranging, FRC feeding and FRC health management. Four farmers from different cooperative; 2 female and 2 males (on-farm) located in Tuyo, Balanga City and Gabon, Abucay and one (on-site) in BPSU were supported with breeder house, stocks of 114 breeders, feeds, madre de agua plants, incubators, trainings. Both sites were 100% adopted the developed technologies and improved the practices in terms of breeder, grower house, brooding, ranging area, feeds, alternative feeds, concoctions and eggshell calphos. The on-site produced fertilized and unfertilized eggs, hardened chicks and growers and layers as a payback scheme for "passing the gift" for second batch of beneficiaries. Three trainings attended by first and second batch of beneficiaries. Production performance on both sites was analyzed with Statistical Tool T-Test: Two sample assuming equal variances. Significant results were obtained for average egg production and mortality rate ($P<0.05$) and no significant results rendered for average sales of eggs, feed consumption and feed cost ($P>0.05$). Financial analysis assumptions for selling price per tray is Php 230-250, Average Annual Sales Volume of Php 519, 661.01, Annual Net Income is Php 185, 921.70, Investment cost is Php 401, 901.00 and ROI is 2.16 years width rate of return on capital of 55.71% per station. The project concluded the increased production of free-range chickens in the community, adopted technology and capacitated farmer beneficiaries. The sustainability plan of the project is recommended to fully utilize the stocks and the inputs for achieving positive return to free-range chickens' growers.

Keywords:

Free-Range Chicken, madre de agua, incubator, on-farm, on-site.

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INTRODUCTION

The Philippine Swine Industry struggled as the African Swine Flu (ASF) adversely affected the business of many swine growers all over the country not only those semis and commercially producing hogs but also the backyard raisers. The disease outbreak forced mostly farms to kill and stop/close their operation. With the continuous situation, the Secretary of Agriculture, William Dar mandated the Department of Agriculture-Bureau of Agricultural Research (DA-BAR) to call proposals to some interested SUC's and package proposal for poultry to address the problem in ASF particularly the decreased volume of protein source in feeding Filipinos and most importantly the need for balanced food this trying time of pandemic in the country. The proposal will specifically utilize the developed technology of Dr. Ma. Asuncion G. Beltran of Tarlac Agricultural College (TAU) was to validate the technology towards a viable enterprise in the Province of Bataan.

Free Range Chicken Raising is one of the most suitable systems of production in the country. The natural behavior of chickens is scratching to search for food. The development of the technology of the Tarlac Agricultural University led by Dr. Beltran is useful to assist local farmers to invest and increase their income. The utilization of the technology makes it easy to train and support the needed technical information and develop skills in proper management of free-range chickens. It is adjunct that the study was conducted to ensure the continuity of producing good sources of protein and increase the income among raisers.

In the province, some individuals produce free range chicken breeders and sell to other farmers who are interested in raising chickens for their own consumption. There was no available data in the market supply and demand of free-range chicken conducted and recorded. However, the potential of raising the species is appropriate to promote and begin to introduce in the market since most Filipinos prefer to eat those freely range animals, specifically health enthusiasts. There were also available food industries in the province like restaurants and supermarkets that were able to sell the products. During these trying times of pandemic, mostly consumers prefer to consume healthy foods with their family.

The products that were produced by the beneficiaries both on-station and on-farm site will be market in the different niche such as having their own stall, online selling, restaurants, supermarkets, hotels, barbecue house and meat shops which are available in the city where most of Bataeños visit to buy basic needs and enjoy food with their families. Some market strategies can be used to market the products such as farmer to trader market where most Filipinos probably done to sell their products. With this, farm gate sales are low as an introductory promoting the enterprise to generate regular income, farmer to retailer market from which the small and big retailers can sell their products in supermarkets and even restaurants. Beneficiaries could also sell through farmers to buyer groups, a system which is not a well-developed market in the country however could work for niche markets such free-range chicken farming, organic poultry farming and native chicken farming. Using the system, health-conscious buyers can pool resources together and purchase poultry products from a reliable supplier. PoultryManual,2017.

The poultry industry of Bataan Province has been producing 29.7 million broilers per year and maintaining a population of 189, 650 laying chickens based on the 2018 data of Office of the Provincial Veterinarian. The population of these birds needs an estimated feed consumption of 63, 476 tons and expected to increase by more than 10% in the succeeding

years. Most of the feed in the broiler sector was supplied by major poultry integrators, while the needs in the backyard poultry, eggs and swine production sector is being catered by the commercial feed companies located outside the province. With this continuing situation, the increase in selling price of products for human consumption will be continuous since raw materials to produce feed was high. The prices of commercial feeds increase by 6-10 percent annually due to continuous increase of imported raw materials such as corn and soybean. The animal raisers of the province, however, have no option but to sustain their operation at higher production cost and in a lower profit. Thus, raising free range chickens is an option to feed and supply the growing population of the province and to support those backyard raisers of native chickens and provide opportunity to bring to market their products. The beneficiaries were chosen based on their capacity and willingness to accept the project as per coordination with their Municipal Agricultural Officer. They were also selected based on their experience as animal growers and availability of land and resources.

Objectives of the Study

The main objective of the project is to develop a viable enterprise using free range chicken production technology.

Specifically, the study aims to:

1. To increase production of F1's of free- range chicken;
2. To increase adoption of free-range chicken production technology developed by Tarlac Agricultural University;
3. To enhance the capacity of selected beneficiaries on the management of free-range chicken enterprise.

REVIEW OF RELATED LITERATURE AND STUDIES

Free Range Chickens Production

Free-Range Chickens is known as modern chickens which raised freely, free to roamed or raised in a pasture area and can naturally live their behavior of scratching to get food, sunshine and exercise. Free-Range is a system of production that raises chickens in a confined environment while allowing the birds to exhibit their natural behavior and allowing them access to forage, grasses, insects, and sunlight. Free range production may be further classified into a) pasture raised a method of production where adult birds (layers) are kept on pasture 12 months of the year, in an outside area that is mainly covered with living vegetation. The birds have access to the pasture through exits from fixed or mobile houses, and covered verandas if present. They are kept indoors at night for protection from predators but it is prohibited to keep them continually indoors 24 hours per day without access to pasture for more than 14 consecutive days, b) traditional free range a method of production that exceeds the minimum requirements (e.g. harvest age) for free range production.

The mandate of the Department of Agriculture is to increase the production of native animals such as native pigs and chickens as a source of protein which in comparison to domesticated breeds does not require costly management. Women and children can easily manage to raise chickens. Mostly in rural areas, households raised different poultry species for their home consumption only. Nowadays, some people engage to free range chicken and raised strains that can produce more eggs and quality meat. Their passion in raising animal push them to invest and make it as an enterprise. The development of technologies

(Beltran,MAG 2020), contributed to disseminate information and encourage many to invest in free range chickens particularly in Tarlac.

Conducted Studies in Free Range Chickens

Several studies on free range chicken were conducted at TAU in the recent years (2016- 2019). On animal health development, studies on: 1) Anthelmintic Efficacy of Kakawate (*Gliricidia Sepium*), Guava (*Psidium Guajava*) And Neem Tree (*Azadirachta Indica*) Crude Leaf Extracts in Free-Range Chicken; 2). Effects of Fermented Oregano, Lemon Grass and Pepper against respiratory infection in free range chicken; 3) Efficacy of kakawate leaves, Neem Tree Leaves and Tobacco Leaves Against External Parasitism in Free Range Chicken. For nutrition research: 1) Utilization of azolla and duckweeds as alternative feeds for free range chicken;2). Production of Natural Calphos for Egg Production for Breeder Chickens. For breeding: 1) Comparison on efficiency of Using Native chicken and locally made-incubators in Hatching eggs. For economic analysis studies: 1) Yield or Produced eggs per Free Range Chicken, 2) FRC Cost and Return Analysis of Raising Free Range Chicken, 3) Initial Effects of the Project to the Beneficiaries and 4. Extension of Technologies on Free Range Chicken thru Capability Building to Farmers. The positive results of these researches will be extended to the beneficiaries.

A study published in the journal Poultry Science divided 600 chickens into three groups: those raised completely indoors, those given outdoor access with artificial shelters and those given outdoor conditions shaded by willow trees. Researchers found that the birds that had outdoor access and natural shelter had juicier, more tender and better textured meat. The researchers believe that the amount of exercise free-range chickens is able to get on a daily basis helps develop their muscles, which results in better flavor and texture.

The equipping of farmers/beneficiaries and other stakeholders on the proper knowledge, skills, aptitudes and technologies of free-range chickens shall be instituted to stakeholders. Below are the current practices of the farmers and alternative technologies which are already tested and given the farmers options to mix and match the technologies they need to adopt to increase their production on eggs and chicks.

Resource speakers tapped by the ATI in a seminar among farmers in Ifugao explained that promoting the technology on FRCP is the new paradigm shift in the livestock industry and before one engages into it he or she must be equipped with the basic scientific knowledge and technology needed. These technologies needed in FRCP include housing and supplies, breeds and their characteristics, brooding, growing and lighting management, laying management, feeds and feeding, alternative feeds, care of eggs and incubation, vaccination, alternative health management, common diseases, treatment and control and recording (Codamon, Philippine Information Agency). There are five breeds in the Philippines that are good for FRC farming that include the Australorp, Rhode Island Red, Light Sussex, Blue Isbar and Plymouth Rock but there are also cross breeds for the raiser to choose such as the Sasso Brown Chicken, Asil Chicken, Naked Chicken and the Black Cemari Turken. In the study conducted in Ifugao, 50 FRC layers that can also be sold for meat at P250/head can produce 9,856 eggs a year and a computation was made that a farmer can have a net gain of P21, 584.00/year with a total gross sale of P81, 49200/year from the P12, 500 for the 50 heads of hens and P68, 992.00 for the 9,856 eggs sold at P7.00 per ‘piece and deducting the estimated total expenses involved amounting to P59, 908.00 also for the

whole year. Farmers will realize more profits in the succeeding years since they will no longer spend for the construction of the housing and other facilities and the more chickens they will raise, the greater income they will get (JDP/DBC- PIA CAR, Ifugao),

Impact of the Technology

Based on the conducted studies of Beltran, 2015, the developed technologies of raising Free Range Chickens provides positive impact such as (1) Free range chicken FRC raising considered a demand driven project where the beneficiaries appreciated by women and children who could easily manned the management. Additionally, it improves the total livelihood of the household; (2) FRC raising improved food production where women produce food for people within the community that produce available and affordable eggs and meat, especially food served in the table in daily basis; (3) FRC raising improved the family nutrition from eggs which considered as complete food that could be prepared as boiled, fried and omellettes, salad and used also in cosmetics; (4) There is an increase in the production of eggs through the use of artificial incubators which in need due to by nature FRC species does not naturally brood the eggs. (5) A demonstration farm was established at Tarlac Agricultural University which a good venue for farmers to learn by seeing for easier adoption by farmers in the field. They also establish more forage species for natural feeds established as a source of seeds and frag species for farmers to plant; (6) Use of ethno-botanicals for the health and disease management of free- range chicken was tested using different fermented products like fermented plant and fruit juices. The effects of fermented oregano, lemon grass and pepper against respiratory infection in free range chicken was very beneficial. Likewise, the efficacy of kakawate leaves, neem tree leaves and tobacco leaves were found to reduce external parasitism in free range chicken during the laying period; (7) There is improvement of family income and combats of poverty.

A positive net income P21,584.00 was seen from production of eggs from 50 heads of chicken per production cycle per farm family was realized;(8) Alternative and doable technologies for farmers was developed such as a) Alternative technology on housing management; b) Alternative technology of brooding management; c) Alternative technology on nutrition and feeding; d) Alternative technology on breeds and breeding Management; e) Alternative technology on growing and laying Management; f) Alternative technology on poultry health management; g) Simple recording management; h)Add-on enterprises on free range chickens productions.

The venture of the beneficiaries increased linkages and connections in the community. Being part or stakeholders of the project exposed them to greater opportunities and access to resources contributory to welfare enhancement. Additionally, the project enhanced self-confidence of beneficiaries especially involved women that gained skills which eventually leads to a higher self-esteem hence making them more productive Lastly, the adoption of the alternative technology developed by TAU. The technology developed on the FRC, Training of Trainers on Free Range chicken production for farmers' livestock school has been adopted by the Agricultural Training Institute for regional and national implementation.

MATERIALS AND METHODS

Criteria for Selection of Project Sites and Beneficiaries

Selection of Project Sites

The project sites were selected based on the following general/indicative criteria:

a. High chicken density;
b. Accessibility;
c. Chicken Production recognized as economically important; and
d. Presence of support system.

At least two (2) community-based sites were selected for the establishment of the free-range chicken communities one in municipality of Abucay and the other is in Balanga City.

Selection of Beneficiaries

Among the two (2) target organization, a total of 4 farmers were selected as the adopters of the project, produced and managed the free-range chicken from which the developed technology of TAU was utilized to increase the production of free-range chicken in Bataan.

The farmers were selected based on the following criteria:

A. Willingness to participate in the project and attend trainings;
B. Willingness to construct housing and establish forage strata;
C. Positive receptivity to innovative technologies; and
D. Have some knowledge and understanding in the management practices for chickens.

Assistance provided to farmer beneficiaries during the implementation of the project.

A. Facilities-construction materials for breeder house were given to the target beneficiaries and materials for fence to secure the area.
B. Equipment-incubator and agricultural supplies (planting materials in feeding free-range chickens) was also be provided.
C. Human Resource- Research Assistant, project staff and caretaker were hired to work and assist directly in the project. They assisted in the implementation of the project in BPSU and in 4 selected beneficiaries.
D. Inputs- Stocks and feeds were provided for initial production and in time chickens laid-eggs farmer beneficiaries purchased feeds to sustain production. Moreover, forage development was also established to reduce the cost of feeds.
E. Operations: The operation of the project led and implemented by the BPSU project team. Monitoring and Evaluation and Focus Group Discussion was done during the implementation of the project.
F. Outbound logistics- Fertilized eggs collected was stored and incubated while unfertilized eggs for consumption. Proportion of eggs was sold as table egg and others was hatched and raised as breeder. As a member of organization, the farmer beneficiaries are assisted by the organization in selling their products. Aside to that, a “passing the gift” scheme was done to beneficiaries to make it sustainable.

G. Marketing and Sales-dissemination and promotion was done by both farmer beneficiaries and BPSU.
H. Services and Trainings- technical assistance was provided such as hands-on trainings with printed guide in raising free range chickens, detailed training recording system. Printable forms were given to beneficiaries to properly account and record all the activities and production performance of the free-range chickens.

Involvement of LGU's and RFO's in the implementation of the project

The LGU's of the target municipalities render a MOA (Memorandum of Agreement) with BPSU to legally conform both parties in the conduct and implementation of the project indicating the role and responsibilities of target beneficiaries and the BPSU.

Agency Counterparts

a. ***BPSU***- the counterpart of the BPSU in the project was the utilization of vehicles in the implementation of the project and technical support.
b. ***Target Beneficiary***- the target beneficiaries provided an area to establish and construct the housing for the project. They also provided an area to establish forage and range for collection of alternative feeds and ranging areas to maintain their natural behavior. Moreover, the target beneficiaries financially shouldered the labor to construct the housing and fence in their areas.

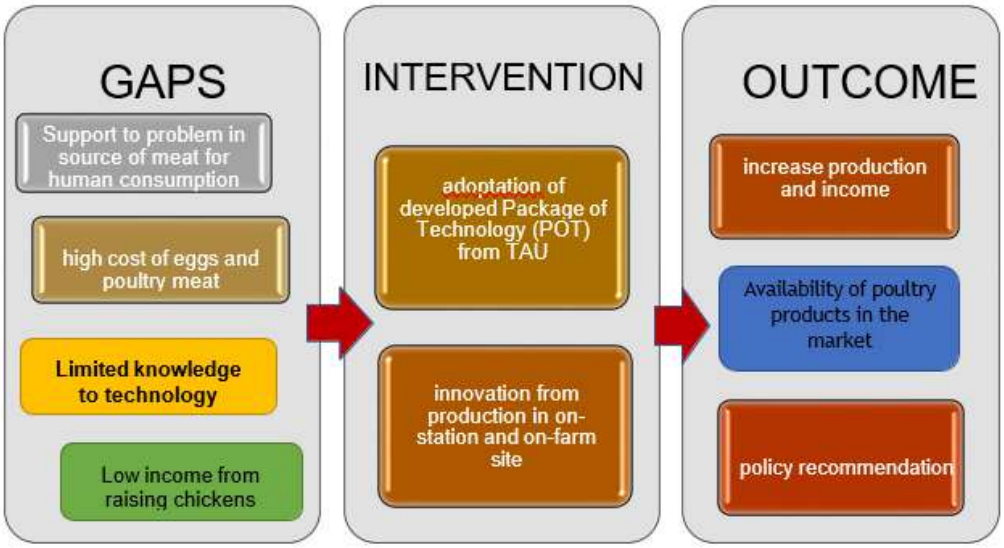

Figure 2. *Conceptual Framework of the Project*

As presented in Figure 2, the conceptual framework of the project which mainly focused on the adoption of the developed technology of Tarlac Agricultural University for raising Free Range Chicken. The main goal of the project was to produced free-range chickens as an enterprise for the target beneficiaries to ensure sufficient production of eggs and poultry meat in the community and the whole communities of Bataan. The project aims to provide an income or source of livelihood to farmers and may increase the income among free-range chicken growers in the province.

Capacity Building for Farmer Beneficiaries. Different trainings will be facilitated by the BPSU for the first and second batch of beneficiaries to capacitate them in management and production of free-range chickens focused mainly in the different developed technologies.

Rolling-out of Free-Range Chicken Technology. After they have received the breeders, the six (6) technologies shall be used by the beneficiaries. The technologies are the following: 1) Free range Chicken (FRC) Housing Management; 2) Free Range Chicken Breeding Management; 3) FRC Brooding Management; 4) FRC Ranging Management; 5) FRC Feeding Management; 7) FRC Health and Vaccination Management. All the technologies were adopted by the farmer beneficiaries, since they are all technically and commercially viable.

The establishment of forage strata will be one of the basic requirements in selecting an association to be the beneficiaries. Availability of raw materials for feeding the chicken will be sustainable thru teaching them how to establish and manage a forage area to have a continuous supply even during dry months.

Monitoring and Evaluation by the Research Team. Recording is one of the most important factors in assessing the real situation of an enterprise. The research team trained the beneficiaries on how to do recording and utilize forms and reiterate the importance of record in any activities they do. This was also the basis of the research team in preparing their reports and monitoring the status of the project. Upon recording, the beneficiaries may produce other means to do recording most applicable and suited for them which can be share to other set of beneficiaries. The research team provided common system of recording for ease of consolidation of reports from farmer beneficiaries.

Regular monitoring with the farmers was conducted and a group chat was created to make the communication easier. Focus group discussion was conducted and to facilitate a meeting and settle concerns and issues for the benefit of both parties and success of the project.

Data Gathering on Animal Performance. The project team conducted a regular monitoring and provided technical assistance. Data of production performance, farm inputs and sales were collected on a monthly basis using devised monitoring forms. Performance of Free-Range Chicken on-station and on-farm site was tabulated during the conduct of the study. The following data were collected and analyzed using T-Test MS Excel Statistical Analysis Tool Pak for one-tailed and two-tailed test assumed that the management practices (on-site and off-site) have equal variances:

a. Egg Production Percentage, %
b. Sales of Egg, Php
c. Feed Consumption, kilogram
d. Feed Cost, Php
e. Mortality Rate, %

Payment of Loans by the beneficiaries. The “passing the gift” method was the scheme for rolling out the free-range chickens. The association will then be the Trainor’s in their community to assist those recipients on how to raise and manage properly the animals. In coordination with the MAO and the first batch of beneficiaries, second batch was selected and

trained prior to distribution of stocks to them for production of eggs. The basic requirement was the following:

a) active member of association;
b) with available area and housing for the chickens;
c) with available area for ranging and forage development;
d) attended the trainings;
e) financially can support the feed cost and other expenses; and
f) pass the gift to other interested member of their association.

RESULT AND DISCUSSION

Results and Discussion of Objective 1. To increase production of F1s of dominant CZ breed;

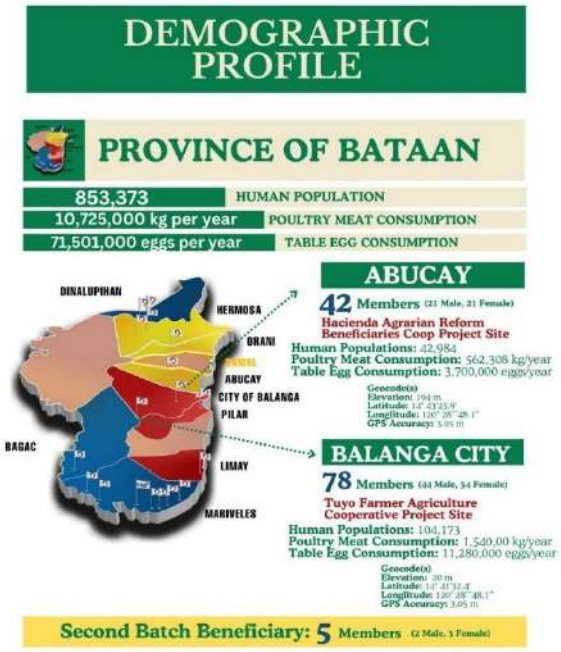

Figure 3. *Demographic Profile of Farmer Beneficiaries*

Based on Figure 3, the province had a total of 853, 373 population and the consumption for meat and eggs was 10, 725, 000 kilogram per year and 71, 501,000 eggs per year, respectively. (PSA, 2020). The values shown the increasing population and the situation on ASF to produce source of protein for consumer can be provided through the raising of free-range chickens. The farmer-beneficiaries from first and second batch of beneficiaries were from Abucay and Balanga City with total members of 42 (21 male and 21 females) and 78 (44 male and 34 female), respectively. The association are Hacienda Agrarian Reform Beneficiaries Cooperative from Abucay and Tuyo Farmer Agricultural Cooperative from Balanga City. The second beneficiaries that received "passing the gift' were 5 (2 male and 3 females) from different association other than the first selected associations due to the unreadiness of another member to receive the project. Furthermore, presented in also in the map, is the location of the farm sites with their geo tags. From total 4 of first batch

beneficiaries, a total of 5 farmer beneficiaries were selected accounted to 100%. However, due to incurred problems during the conduct of the study especially in cost of feeds and others, the BPSU project team decided to support the production of chicks and produce ready to lay to dispersed for the second batch of beneficiaries. With this, the BPSU and the farmer beneficiaries had an arrangement stipulated also in MOA that they will produce chicks and disperse to interested members of association amounting to the value of initials stocks they received.

Purchased and Distribution of Initial Stocks

The BPSU Abucay Campus on station site and the (4) farm site received a stock (100 female and 14 males) of free-range chicken breeders. The on-station site produced chicks and hardened chicks for a payback scheme.

Passing the Gift to Second Batch of Beneficiaries

A total of 205 as of July 31, 2024 were being released for the second batch of beneficiaries at average age of 3 to 4 months old and continuously producing to support the farmer first batch of beneficiaries' payback schemes. A contract was signed between BPSU and the first batch farmer beneficiaries as their payback scheme, they will be producing 500 chicks that will be disperse to interested member of their association provided they attended a seminar related to free-range chicken management under BPSU Abucay Campus to augment them of the high cost to produce breeders and other inputs.

Results and Discussion of Objective 2. To increase adoption of free-range chicken production technology developed by Tarlac Agricultural University.

Housing Management

A total of 5 units of breeder house with dimension of 12 x 3 meter was constructed in on-station (BPSU) and on farm site (Balanga City and Abucay). The construction materials were provided by BPSU and counterpart of the farmer beneficiaries was the labor cost to build the house inclusion of fence materials. The breeder house was designed for 110 birds provided with waterer, drinker, light, perches, nest box and curtain for protection to heavy rains and winds. The house is an elevated type to manage the excreta properly and prevent contamination of egg (PNS/BAFS 262:2018) ICS 65.020.30.

Breeding Management

A total of 561 F1's stocks with 496 breeder females (Dekalb Brown and Brown Nick) and 65 breeder males (Brown Nick) were provided to the on-station and on-farm site. And 14 males were distributed per farmer beneficiaries. The chickens were raised for production of eggs (fertilized and unfertilized), meat and production of hardened chicks. A ratio of 1:7 was used in the project. However, to maximize the resources, the production of unfertilized egg was prioritized to acquire sales and have a budget for feeds. The breeds of Dominant CZ and Dekalb brown are classified as Hybrid layers and can be grown on a cage-free environment (PNS/BAFS 312:2021). As of June, a total ending inventory of stocks on-station and on-farm site was, (78), (57), respectively from the beginning stocks of 100 female breeders per both stations.

Brooding Management

On-station site farm established the brooding management of producing chicks using a brooder box with waterer and feeder, incandescent and ceramic light as source of heat, temperature and RH checker and rice hull as litter material (Beltran, MAG.2020).

As of June 30, 2024, a total of chicks 212 accounted for (100%) increased in the population are in the brooding house until 35 days before they will be transferred to grower house. The farmer beneficiaries in Abucay were able to initially use their incubator and prepared brooder box on the month of June. Moreover, from March to June one beneficiary, produced 80 hardened chicks tried to incubate from outside source accounted to 80% of increased in the production.

Ranging Management

An area was established on both sites where the free-range chicken during the day roam freely and acquire Vitamin D directly from the sun without limiting their natural behavior such as pecking, foraging, perching, nesting, dust bathing, preening and fighting. However, during rainy days the free-range chickens were fully confined in the housing to secure and keep them healthy that conforms to the guidelines from PNS/BAFS 296:2020), the access to the range area shall be available during daylight hours unless prevented by bad weather or due to veterinary advice. Included in the inputs provided to the farmer beneficiaries are fence materials to secure the stocks and area for ranging and established forage area.

Feeding Management

The on-station produced feeds for layers, chicks and growers using formulated diet of layer 1, layer 2, booster and grower feeds. Alternative feeds were given to layer breeders by provision of 100g of feeds and 20 g of fresh madre de agua leaf meal and azolla. For on farm site, the farmer beneficiaries purchased commercial feeds near on their areas. Alternative feeds such as madre de agua leaves, azolla, malunggay leaves, rejects vegetables and banana were provided to breeder which is locally available and environmental enriched based on the (PNS/BAFS 312:2021) and (Beltran, MAG 2020).

Health Management and Protocol

The established vaccination schedule is essential to ensure optimal protection. This aims to prevent and control infectious diseases that have the potential to cause substantial harm to the health, welfare, and financial stability of poultry projects, to reduce morbidity and mortality rates in poultry populations, and to improve overall flock health and productivity.

Vaccination Program

Vaccination programs in poultry are essential for maintaining the health and productivity of chicken flocks. This program is designed to prevent and control infectious diseases that can significantly impact poultry health, welfare, and economic viability.

As part of the program of the free-range project established by the Bataan Peninsula State University (BPSU) – Abucay Campus in collaboration with the Department of Agriculture (DA) – Agricultural Competitiveness Enhancement Fund (ACEF), all brooder and grower chickens are vaccinated of ND and IB and all the farm breeders are vaccinated

against ND (Lasota Strain), IB, Fowl pox, Coryza and Mycoplasma. Said program has led to positive outcomes including reduced disease incidence, improved flock health, enhanced productivity and lower medication costs.

Health Management

In general, poultry are highly susceptible to environmental changes, particularly extreme weather conditions. In the farm, extreme weather conditions have been encountered which resulted in a disease challenge. Some of the grower chickens showed signs of respiratory problems such as nasal discharge, labored breathing with drooping wings, and decreased feed intake and lethargy.

The disease challenge had adversely affected the health and productivity of the flock which caused almost 100% morbidity and more than 50% mortality in a batch of grower chickens. Thus, implementing effective interventions, such as maintaining optimal environmental conditions, adhering to biosecurity measures, and following medication and vaccination, can mitigate these challenges. Regular monitoring and early intervention are crucial to ensure the well-being and productivity of the flock.

Mortality Report

Presented in Table 2. Mortality Report of the breeders on-station and on-farm site.

Table 3. Average Mortality Report on Breeders.

Year	On-Station Site	On-Farm Site
2023	10	17
2024	11	25

On-station recorded a total of 10 and 11 breeders on 2023 and 2024, respectively. However, on farm site, accounted a mortality of 17 and 25 on 2023 and 2024. Although Table 3 suggests slightly significant mortality (not exceedingly more than 5%), the primary contributing factor is likely the adverse weather conditions. By implementing the recommended measures promptly, we can reduce losses and improve overall poultry welfare on the farm.

Production Performance of Free-Range Chickens on-station and on-farm site

Presented in Table 4, is the production performance of free-range chicken on both stations.

Parameter	On-Station	On-Farm	P-Value
Average Egg Production, %	72.91%	50.66%	P(T<=t) one-tail 0.000413 P(T<=t) two-tail

			0.000413
Average Egg Sales, (monthly, Php)	103,790.00	100, 189.25	P(T<=t) one-tail 0.226709 P(T<=t) two-tail 0.453419
Average Feed Consumption, (monthly, kilogram)	246.59714	319.2857	P(T<=t) one-tail 0.0616023 P(T<=t) two-tail 0.1232047
Average Feed Cost, (monthly, Php)	144,622.08	104,823.41	P(T<=t) one-tail 0.38991233 P(T<=t) two-tail 0.77982466
Average Mortality Rate, (monthly, head)	2.00	3.16	P(T<=t) one-tail 0.00916013 P(T<=t) two-tail 0.01832025

Presented in Table 4, is the production performance of free-range chicken in on-station and on-farm site. The values obtained significant differences in average egg production and mortality rate and no significant difference among the values for average egg sales, average feed consumption and average feed cost. The values obtained for egg production in on-farm site was lower the standard values for laying percentage. This is greatly affected by the changes of feeds and quality of feeds provided to the free-range chickens that must be conformed in accordance with the provision stated in Philippine National Standard on Animal Feed Ingredients and Philippines National Standard on Code of Good Animal Feeding stated that all chickens shall receive adequate quantities of feed and nutrients daily to enable them to maintain good health, meet physiological demands and avoid metabolic and nutritional disorders that may affect the egg production and their health (PNS/BAFS 296:2020). The average egg laying of 72.91% at on-station site conformed with the free-range chicken standard value with laying percentage of 71-79% and produced eggs from 260-290 eggs/year. However, the lower percentage obtained from farm-site was below standard which is due to many factors in the practices such as in feeding, lighting, and health condition of breeders (Beltran, MAG.2020).

The mortality was due to adverse condition during rainy and summer months that influenced also the quality of egg produced and caused morbidity led to death. The values for mortality rate did not exceed 5% both on sites and was lower to the values obtained for a year of 9-10% (Beltran, MAG.2020).

Table 5. Summary of Income Report per Beneficiary.

BENEFICIARY	Year	Total Sales, Php	Total Expenses, Php	Net Income
Abucay 1	2023	54,327.00	71,776.00	-17,449.00
	2024	55,280.00	68,340.00	-13,060.00
Abucay 2	2023	41,188.00	46,908.00	-5,720.00
	2024	49,400.00	47,780.00	1,620.00
Balanga 1	2023	48,326.00	49,400.00	1,442.34
	2024	46,883.66	49,064.60	335.40
Balanga 2	2023	40,865.00	43,623.42	-2,758.42
	2024	51,542.00	44,918.60	6,623.40

The income reports for Abucay and Balanga beneficiaries reveal varying financial performances from 2023 to 2024. Abucay Beneficiary #1 experienced a net loss in both years, with a deficit of ₱17,449 in 2023 and ₱13,060 in 2024, despite an increase in sales. The expenses for this beneficiary exceeded the revenue generated in both years. Similarly, Abucay Beneficiary #2 showed a loss of ₱5,720 in 2023 but managed to turn a small profit of ₱1,620 in 2024, indicating an improvement in expense management and higher sales.

On the other hand, Balanga Beneficiary #1 maintained a positive small net income. It earned ₱1,442 in 2023 and slight reduction to ₱335.40 in 2024, reflecting nearly equal sales and expenses. Balanga Beneficiary #2 improved significantly, overcoming a loss of ₱2,758.42 in 2023 to achieve a profit of ₱6,623.40 in 2024, driven by a substantial increase in sales and better control over expenses.

The financial analysis of the free-range chicken production project indicates that the business model is economically viable, with a net income of ₱1,859,216.96 over ten years and a 55.71% rate of return on capital. The consistent revenue from egg and chick sales, along with occasional income from culled chickens, outweighs the fixed and operational costs, making the project profitable in the long run. However, individual performance among the project's beneficiaries varies. While all beneficiaries saw growth in sales from 2023 to 2024, Abucay Beneficiary #1 continued to operate at a loss, whereas Abucay Beneficiary #2 turned a small profit in 2024. Similarly, Balanga Beneficiary #1 maintained a small profit in both years, while Balanga Beneficiary #2 made a significant recovery from a loss in 2023 to a profit in 2024.

The steady sales growth across all beneficiaries reflects strong market demand for free-range chicken products, but controlling costs will be essential for maximizing profitability. While the startup model shows promise, especially in generating steady revenue, optimizing expenses related to feed, medicine, and operational costs will be crucial for improving the net income of beneficiaries currently facing losses or low profits. Overall, the project has the potential for long-term success with better cost management strategies.

Results and Discussion of Objective 3. To enhance capacity of selected beneficiaries on the management of free-range chicken enterprise

The project team and the first batch of beneficiaries attended a Training of Trainor's at TAU, Camiling, Tarlac last January 30-31, 2023 facilitated by Dr. Ma. Asuncion G.

Beltran focused on the different technologies. Pre-test and post-test were given to participants to assess their level of knowledge in growing free-range chickens and to acquire knowledge from the provided lectures of different assigned speakers. (Beltran, MAG 2020). An actual demonstration on different concoction making was facilitated by farmer beneficiaries of the project. A tour was also conducted in the project at TAU and from different farmer cooperators on the second day.

The second training was conducted last April 23, 2024 by the project team in BPSU Abucay Campus entitled "operation and management of incubator" participated by the first and second batch of beneficiaries. Moreover, during this period, the unit of incubator was awarded to farmer beneficiaries and actual demonstration of forage chopper was conducted.

The last training was conducted on April 29-30, 2024 at BPSU Abucay Campus for the management and production of DA-ACEF second batch of beneficiaries. The first batch was also invited to attend the said training. Hands-on training of concoction making (DA-ATI.2021) was facilitated where the first batch of beneficiaries experienced how to prepare following the ingredients and procedures. Farm visit was also conducted at the second day of the training where the participants were able to have a hands-on observation in candling, releasing of chicks from hatcher and placing it in brooder boxes. They also visit the breeder house for the production of eggs and the forage demonstration area of madre de agua and azolla. Over-all a 100 % training was conducted to capacitate the farmer beneficiaries from first to second batch of beneficiaries.

Sustainability Framework Plan

Presented in Plate 24, the Sustainability Framework Plan for Free-Range Chicken Raising through the FRC enterprise, the beneficiaries earned income and invested it as capital to support the operation and for expansion of the project. The BPSU will propose for research and extension projects related to the first project to continuously assist, monitor and evaluate the project until the beneficiaries are able to accomplish the dispersal for "passing the gift" scheme.

The project sustainability plan initiated through the utilization of sales from produce to support the expenses in feeds. The project team initially requested support from the Research and Development Office of the university for continued research output through the submission of proposals related to the project. The creation of association among the farmer beneficiary is one of the plans and a continues conduct of research and extension project will be done to continuously support the farmer beneficiaries until they able to provide and accomplished the "passing the gift" scheme. For the marketing aspect, the project team and farmer beneficiaries will establish a local market hub for the produce in coordination the LGU and DTI and other sector. A collaboration with a private partner or institution is also a plan to strengthen the production and increase the linkages of the project. Moreover, during the time the produce was enough for value adding to market other secondary products and fully utilize the produce both on-station and on-farm site. After three to five years of raising free-range chickens, an impact assessment of the project to target beneficiaries in terms of earnings/profitability and how the project helps each farmer beneficiaries.

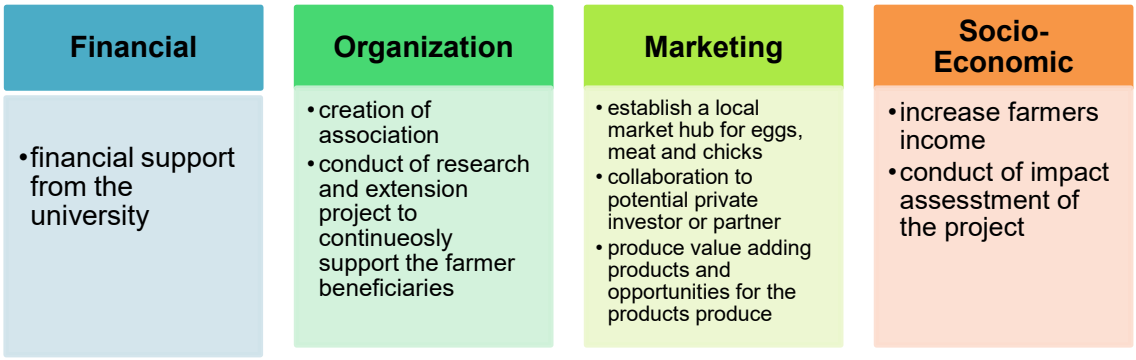

Figure 4. *Sustainability Plan of Free-Range Chicken Production*

Best Practices on the production and management

The projects both on-station and on-farm site best practices were the provision of stocks and construction materials for housing whereas the technology on housing management was adopted and improved using elevated type of housing for free-range chicken breeders to ease the management following the basic requirement for space and availability of equipment such as feeder and waterer, nesting area and the provision of materials needed to let stocks exercise their natural behavior such as perching, pecking, preening. Provision of nest box on the back side of the house and used of brooder box to secure the chicks in rodents' other animals and usage of different source of heat suck as incandescent bulb and ceramic bulb. Utilization of different alternative feed additives for feeding stocks, used of improvised chopper for madre de agua, used of social media to promote and sell products, used of group chat for ease of communication. Strict compliance of simple bio-security measures. Provision of incubator to the beneficiaries and planting materials for forage area.

Challenges met during the implementation of the project

During the implementation of the project, the following are the challenges met from the on-station and on-farm site:

a. health condition of the stock and the stocks for farmer beneficiaries;
b. processing of procurement;
c. unavailability of stocks, raw materials and the high price; and
d. uncontrolled factors such as high inflation rate and weather condition.

Conclusion

Based on the above findings and achievement of the project, it is concluded the 100% increased of farmer beneficiaries that engaged in free-range chickens raising from first batch to second batch. The different technologies developed were utilized by the on-site and on-farm station and intervention were produce to make the management both less labor intensive and improved the production with farmer's practice and strategies. The farmer beneficiaries from the first and second batch were capacitated through lecture, actual demo, actual exposure to the farm. Moreover, in general, free-range chicken is a viable enterprise provided with good husbandry practices in free-range chickens.

Recommendation

The project team recommends the continuation of the project into research cum extension to further study the potential of the free-range chickens into its optimum production performance and to develop other research output that may be utilized by the farmer beneficiaries such as developing feeds for different stages, conduct of value chain analysis of the free-range chicken by-products other than eggs, production of madre de agua as feed ingredients for feeds, and development of products which can be transfer to farmer beneficiaries and other interested groups or association or individuals. Moreover, to assist the farmer beneficiaries from first to second batch on their production and management until they complied the passing the gift scheme and monitored their milestones.

Conflict of interest

The authors have no conflicts of interest to declare between the team members and the funding agency.

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