Research Activity Outline

(to be used for planning of research activities within a larger (donor) funded projects)

1. General Information

Concise but explicit title for the research activity:

Characterising Productivity of Village Chicken Eco-types under Free-range Semi-intensive and Intensive Management Systems in Keravat, Papua New Guinea.

Name of the project this research activity contributes to:

Livestock Project

Which associated project outputs does this research activity relate to:

Livestock Genetic Resources Improvement

Research activity Leader and other team members:

Fred Besari

Dr. Michael Dom

Estimated duration of the research activity:

2 years (and extension pending prior advice)

Estimated total budget:

Particular(s)	Year 1				Year 2				Total
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	
Phase 1 Stock Establishment, Stock feeds and equipment, feeder, drinkers, freights and electricity	5000								5000
Phase 2 Paddock, shed and fencing		2000	3000						5000
Phase 3 Stock feeds		1000	2000						3000
Phase 4 Stock feeds				1000	1000	1000	1000	1000	5000
Phase 5 Electricity, hatchery and feeds				1000	1000				2000
Total	**5,000**	**3,000**	**5,000**	**2,000**	**2,000**	**1,000**	**1,000**	**1,000**	**20,000**

2. Introduction

Village chicken production has a long-standing cultural significance in the Islands Region and is realized for its nutrition and direct income generation for farming households.

In East New Britain Province, the village chicken is prepared with vegetables, taro, and banana in a special coconut cream-filled recipe called Aigir (Food for Life). A piece of each cooked ingredient is packed in banana leaves called Totongor and sold at K5.00 per parcel. A bird being cooked and prepared in such a way usually fetches approximately K30.00.

Apart from commercial broilers, about 3/5 respondents usually prefer village chicken in Totongor because of taste and belief in wellness. This opportunity presents a case for improved management of village chicken for nutrition and income generation.

In terms of corresponding to production and management systems, it is assumed that naked neck chickens are heavier and good for meat production, dwarfs are good for laying eggs and frizzles are good at brooding and hatching eggs due to stylish feather arrangement for effective airflow and thermal regulation.

This study will generate information on effective management and rapid production of village chicken to supply already established markets for nutrition and income and form the basis for breeding at later dates.

3. Strategic Objective

Characterizing productivity of village chicken genetic resources and its role in the farming system to meet end-users' demand

4. Major Output(s)

a. Growth, production, and reproductive cycle of village chicken eco-types under free-range and semi-intensive management systems are indicated.
b. Production characteristics, potentials, and desirable traits of village chicken eco-types under free-range and semi-intensive management are observed.
c. Effective management of village chicken under the free-range and semi-intensive systems is developed.
d. Information on desirable traits of different village chicken eco-types is developed and recommended for further research.

5. Research Methods, Tools and Materials

- Type of research

On-station trial		IRC	**On-station livestock/fish trial**			**Economic studies**	
Laboratory trial			**Survey/PRAP[T]**			**On-farm**	

Tick appropriate box(es) *Specify Type:* _____

[T]Participatory Rural Appraisal and Planning

The on-station experiment will be planned and conducted to capture the growth, reproduction, and egg production cycle of village chickens under a free-range semi-intensive management system and intensive management system. The village poultry shed being constructed under the EU CCR project will be used for intensive management while the fencing parameter around the chicken shed will be used for free-ranging and a shed will be used as a night shelter (semi-intensive).

The popular village chicken eco-type (strain) including normal, naked neck, dwarf, and frizzle will be used in the experiment. These are the major phenotypic traits in village chickens while other traits are common across the strains. These birds will be sourced from villages in New Britain. The mature birds will be stocked as breeders and breed within their strain. It requires 2 males and 14 females from each strain, a total of 8 males and 56 females. The birds will be synchronized through induced molting, and fed with commercial layer feed afterward to enhance reproduction potential. Afterward, 40 eggs from each group will be collected, labeled, and stored in the cool room for incubation. The hatches will be used in the particular experiment from Phases 2 to 5 as described below

- Describe the materials and protocols to be used in this study/research activity;

Phase 1: Incubation and brooding period (3 months)

It will take 1 week to store eggs in the cool room, 3 weeks to incubate them, and another 5 weeks of observation in the incubation room. The common variables that will be used include hatchability rate to indicate fertility, and mortality rate to indicate survival rate. The day-old chicks will be sexed and allocated evenly to brooders containing each strain and sex. The spacing density, the number of birds, and the external and internal environment and feed during the brooding period will be uniform for all groups. The broiler starter feed produced by Flame and good clean water will be provided on daily basis.

Phase 2: Pullet stage, and point of lay (7 months)

From week 6, the birds will be divided into six groups and 1 male and 5 female pullets from each group will be used under a free-range semi-intensive management system while 1 male and 5 female pullets from each group will be used under an intensive management system. The pullet grower diet produced by

Farmset Ltd will be fed to the pullet on an ad-lib basis and allowance to feed at will from 7 am to 5 pm for birds under free range up to the point of laying. The data on weekly body weight, feed offered and feed refusals will be collected.

Phase 3: Grow-out stage and market weight (7 months)

At week 6, 20 male pullets from each group will be selected according to average weight range _±0.05 and 10 male pullets will be used under a free-range semi-intensive while the other 10 males will be used under an intensive management system. The pullet grower feed will be offered from week 6 to week 18 and the broiler finisher will be offered from week 19 until they reached 2kg live body weight. The variables to be measured include weekly body weights, feed offered and feed refusals, temperature, and humidity.

Phase 4: Hen Day Production and Egg Production Cycle (24 months)

From phase 2, the birds will be offered egg layer feed produced by Farmset Ltd. and monitored throughout the first egg production cycle until week 75, induced molting for 10 days, and continued second cycle until week 118. The variables to be measured include feed offered and feed refused, weekly body weights, number of eggs laid daily, temperature, and relative humidity.

Phase 5: Reproduction – Fertility, broodiness and hatchability (7 months)

Absolutely 16 hens will be used to assess the reproductive potential of each strain at the point of lay. Under a free-range semi-intensive management system, 2 hens and 1 cockerel from each strain will be allocated to each pen, provided with a nest box to lay eggs and brood. The hens will be fed egg layer fed with the provision of good clean water. Afterward, the hens will be allowed to scavenge during the day as well as brood and locked up at night. While under an intensive system, 2 hens and a cockerel from each strain will be kept in each pen, fed egg layer feed with the provision of good clean water. The eggs will be collected, labeled, weighed, and stored in the cool room for a week and then, set in the electric incubator. The main variables to be measured include eggshell thickness, egg yolk color, albumen quality, hatchability rate, and survival rate of progeny from day 1 to day 5.

Experimental Design

A 2×4 Factorial Design will be used in this experiment to test village chicken strains and the management systems, and strain x management system interaction on the growth, egg production, and reproductive performances. Importantly, a newly Build EU CCR Village chicken shed will be used for an intensive management system that has 4 pens, an artificial hatchery room, and a natural hatchery room. The four other units to be used in free-range semi-intensive management come from a newly built shed that has 4 rooms at the dimension of 7m x 6m per room. Each bird will be representative (Rep) of the strains.

Table 1: Shows 2x4 Factorial design with management systems and strains as independent variables.

2x4 Factorial Design		Independent Variable 2: Management System	
		Free-Range S-Intensive	**Intensive**
Independent Variable 1: Village Chicken Eco-type (strain)	**Normal**	Hen Day Production	Hen Day Production
	Naked Neck	Hen Day Production	Hen Day Production
	Dwarf	Hen Day Production	Hen Day Production
	Frizzle	Hen Day Production	Hen Day Production

Table 2: ANOVA Table for TWO-WAY ANOVA

Source of Variation	Sum of Squares (SS)	Degree of freedom (df)	Mean Square (MS)	Expected mean squares (EMS)
Strain (A)	SSA	a - 1	MSA	$\sigma_\varepsilon^2+n\sigma_{sm}^2+bn\sigma_s^2$
Management System (B)	SSB	b - 1	MSB	$\sigma_\varepsilon^2+n\sigma_{sm}^2+an\sigma_m^2$
Interaction A*B	SSAB	(a - 1) (b - 1)	MSAB	$\sigma_\varepsilon^2+n\sigma_{sm}^2$
Error	SSE	ab(n -1)	MSE	σ_ε^2
Total	TSS	abn -1		

5. Data collection and analysis

There are 5 phases to the experiment and the first phase is preparatory to meet the requirements of the experiment. The data will be collected from Phase 2 to Phase 5 include weekly live body weights, daily feed offered and refused, point of lay, temperature and relative humidity, the daily number of eggs laid, eggshell thickness, egg yolk color, albumen quality, hatchability, and survival rate. Analytical parameters include feed intake, feed conversion efficiency, feed conversion ratio, body weight, body weight gain, point of laying, and hen day production. The data will be entered into Microsoft Excel®, aggregated, and sorted. The data will be further imported into Genstat® for analysis using Two-Way ANOVA. Duncan's multiple tests will be used for mean separation.

6. Reporting and types of publications

During the experiment, weekly reports will be made available for comments and suggestions. Progressive reports will be submitted monthly and quarterly. All information gathered from the experiments will be compiled and published in NARI's Technical Bulletin

7. Peer review and endorsement

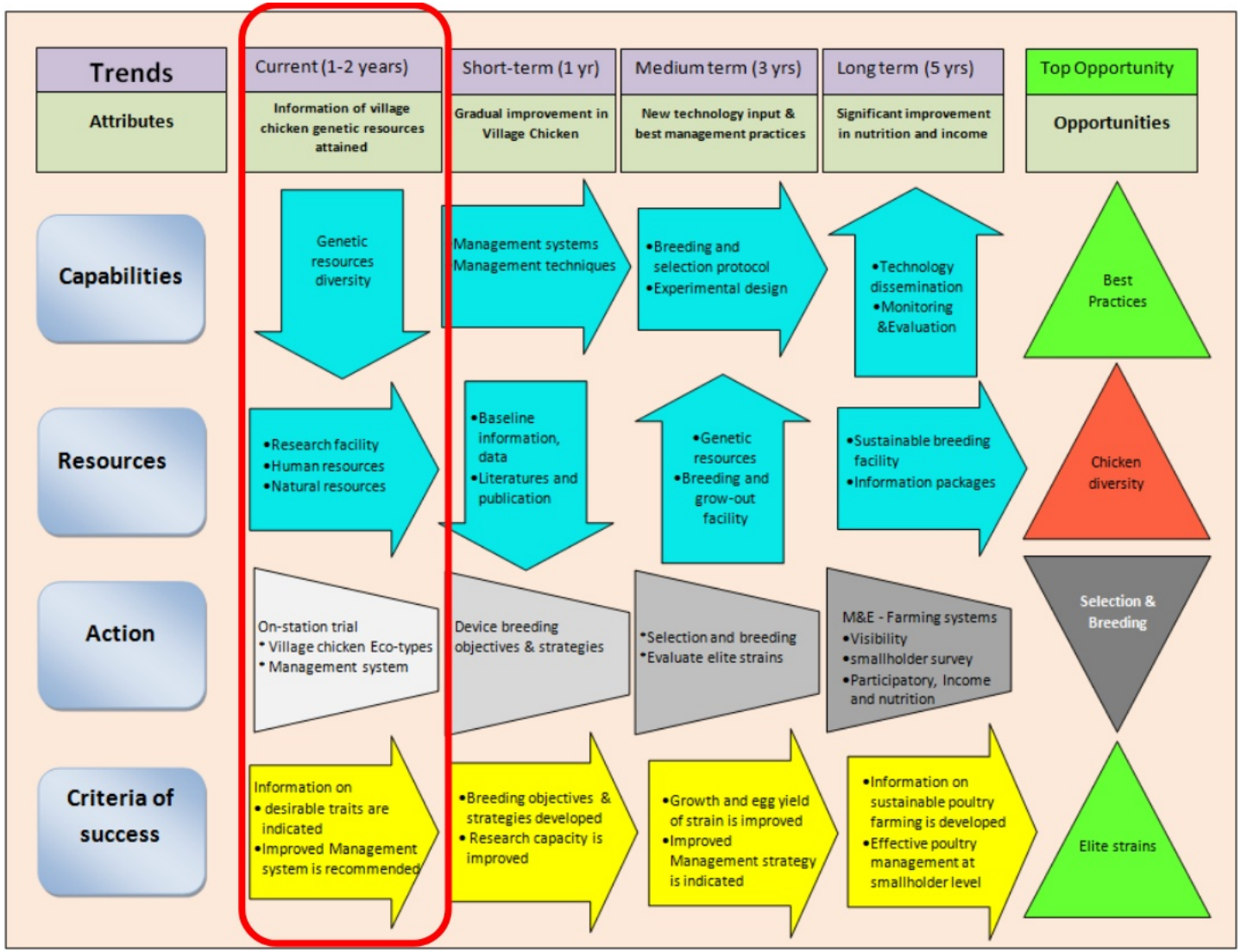
- 1 x Power point presentation at IRC – Scheduled for 16 November 2022

- Reviewed by Dr. Dom

- 2nd Presentation done at IRC with Comments from RDC, CM and Scientific staff on the 15th March 2023.

Road Map – Research Action Plan (Genetic Improvement of village chicken eco-types)

The red rounded rectangle indicates where this study sits on the road map.



Return from the project budget.

Phase	System	Male	Female	Eggs expected	Actual/ month	Income/month @K1/egg, K10/chicks & K20/broiler	Income/ cycle	Total Amount
1	Free Range	4	28	352.8	320	3200	9600	
	Intensive	4	28	352.8	320	3200	9600	19 200.00
2	Free Range	4	20	252	230	230	2760	
	Intensive	4	20	252	230	230	2760	Phase 4
3	Free Range	10		10		200	200	
	Intensive	10		10		200	200	400.00
4	Free Range	4	20	252	230	230	5520	
	Intensive	4	20	252	230	230	5520	11 040.00
5	Free Range	4	8	100.8	90	900	6300	
	Intensive	4	8	100.8	90	900	6300	12 600.00
							Total Income	43 240.00

About 112 female and 44 male stock will be retained as breeder after the project ends estimated at K3 120.00

The village chicken egg production is based on 45% Hen Day Production (HDP), and less 9% loss related to cracks (spoil), under weight and mortality in case of live birds.

Thus, the rate of return on investment = $\frac{Est.\,Sales\,value - budget}{initial\,cost} x\,100\,\%$

$= \frac{43\,240 - 20\,000}{43\,240} x\,100\,\%$

= 53.7%