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## **PERFORMANCE OF FAMILY POULTRY (CHICKEN) HUSBANDRY PROGRAM IN ARTIBONITE AND SOUTHERN DEPARTMENTS OF HAITI: PROSPECTS AND WAY FORWARD**

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## Acronyms

APA	Agent de Prophylaxie Aviaire
MPCE	Ministère de la Planification et de la Coopération Externe
FAO	Food and Agriculture Organisation
IFAD	International Fund for Agricultural Development
INFPD	International Network for Family Poultry Development
NPFS	National Programme for Food Security
OECD	Organisation for Economic Co-operation and Development
MARNDR	Ministère de l'Agriculture des Ressources Naturelles et du Développement Rural.
GERMALOT	Ferme De production Agricole et Agro-Industrielle
USD	United States Dollar

## Résumé

L'appui à l'aviculture familiale offert aux éleveurs des deux départements (Artibonite et Sud ) d'Haïti est les fruits de plus de sept ans de partenariat entre le Ministère de l'Agriculture, des Ressources naturelles et du développement rural (MARNDR) et l'Organisation des Nations Unies pour l'Alimentation et l'Agriculture (FAO) visant à résoudre les problèmes de la malnutrition, l'insécurité alimentaire, le faible revenu et la pauvreté en général. L'innovation consistait à améliorer les performances des cheptels avicole à travers l'introduction des coqs d'espèces exotiques (bien connus pour leurs meilleure poids vifs et une capacité de production d'œufs élevée), subventions des poules locales, des formations sur le contrôle des maladies et des vaccinateurs communautaires, la gestion du cheptel, l'organisation des campagnes de vaccination, la construction de poulaillers pour limiter les mortalités due aux prédateurs et un suivi technique de proximité par les techniciens du MARNDR.

La présente étude avait pour objectif d'évaluer cette intervention afin d'établir le contexte socio-économique de l'appui, évaluer les performances des unités avicole familiale mises en place, déterminer leur contribution à la sécurité alimentaire et la viabilité économique de ces entreprises dans les départements du Sud et de l'Artibonite ainsi que les défis de développement du sous-secteur. Les données primaires et secondaires collectées auprès de 132 enquêtés, l'exploitation des données de neuf mois de terrain trouvé au MARNDR et celles collectées auprès de 9 éleveurs ont été analysés à l'aide des logiciels Excel et STATA version 10.

Les résultats d'analyse ont montré qu'une grande proportion (57,6%) des ménages atteints par le projet était les pauvres. Ces dernières dépensent en moyenne \$50,46 par mois pour les produits non-alimentaires, \$116,9 pour l'alimentation et ont un ménage d'une taille moyenne de 4,1 personnes. La majorité absolue des enquêtés de sexe masculin possèdent des parcelles de terrain de 0.40ha et plus, alors que la plupart des femmes interrogées ont moins de 0,40ha. Les poulaillers sont construits non loin des habitations familiales autour des quelles les oiseaux se nourrissent par le système de divagation avec une supplémentation en céréales trois (3) fois par jour. Une moyenne de \$41,6 est consacrée aux achats des médicaments, service de vaccinations et alimentation des volailles. Les frais de médicaments et les vaccinations se situaient à une moyenne de \$2,1 tandis que les dépenses de construction des poulaillers s'élève à \$78,1 en moyenne.

Les données d'enquête montrent que la taille moyenne de volaille possédée par chaque ménage est constituée de 3 coqs, 7 poules, 5 coquelets, 13 poussins et 6 poulettes avec une différence non significative entre les anciens participants du projet et les nouveaux. Les différences entre les départements ont été observées, étant pour preuve que le nombre d'œufs pondus par une poule locale dans le département d'Artibonite est sensiblement différente ( $P < 0,01$ ) et plus élevée que ceux des poules locales dans le département du Sud. En outre, la taille de la couvée et le nombre d'œufs éclos sont sensiblement différents ( $P < 0,01$ ) et plus que ceux du département du Sud. Le nombre moyen d'œufs pondus par poule de la race croisée (14,25) est sensiblement différent ( $P < 0,01$ ) et (36%) plus élevés que ceux pondus par une poule locale.

Les croisés des coqs exotiques et poules locales avaient un plus grand poids vif et par conséquent une meilleure valeur marchande que ceux de poules rustiques. Toutefois, les progénitures des croisements des coqs exotiques et poules locales ne sont pas différents de ceux des croisements rustiques pures en matière de couvaion et l'élevage des poussins. Les marges brutes de l'aviculture familiale sont comprises entre \$74-\$429 avec une marge bénéficiaire nette de \$27-\$226. L'aviculture familiale est donc rentable indépendamment de savoir si c'est l'élevage de divagation ou le système semi-intensif.

Les bénéfices nettes représentent 7,3%, 3,2% et 2,2% des dépenses mensuelles non-alimentaires, alimentaires et (non+)alimentaires des ménages enquêtés respectivement avec ceux des anciens participant du projet bien supérieurs à ceux des participants nouvellement recrutés. Les marges brutes représentent 13,1% et 5,7% des dépenses non-alimentaires et alimentaires respectivement avec les anciens participants du projet encore mieux que les participants nouvellement recrutés. En outre, le nombre d'œufs (96) disposés chaque année par un enquêté montre qu'en moyenne 39, 39 et 18 œufs ont été vendu, consommé ou donné comme dont. Pendant ce temps, les nombres de volailles vendues ou distribuées par les participants qui ont profités de l'appui du projet étaient significativement différents ( $P < 0,05$ ) et plus élevés que ceux vendus ou des cadeaux octroyé par les homologues nouvellement recrutés.

La performance de l'aviculture familiale (poulet) et sa contribution au bien-être des ruraux pauvres en Haïti pourrait être considérablement amélioré si les contraintes du sous-secteur sont abordées. Des mesures devraient être prises pour réduire le principal obstacle qui est la mortalité

des oiseaux à travers l'institution d'un système de vaccination durable, meilleure gestion des volailles, s'assurer que les agriculteurs adoptent des bonnes pratiques de biosécurité, ainsi que la facilitation d'accès aux inputs (aliments, médicaments,...). Les poulaillers construits doivent être résistant aux catastrophes naturelles telles que les cyclones, hurricanes et inondations. Un suivi de proximité serait un atout incontournable pour s'assurer de la bonne maîtrise des problèmes de ce sous-secteur. Pendant ce temps, des recherches supplémentaires sont nécessaires pour identifier des poules rustiques performantes qui pourraient être croisées avec les oiseaux exotiques introduites pour un meilleur rendement.

## Executive summary

The family poultry support provided to farmers in Artibonite and South departments of Haiti is a result of a over seven years of partnership between the Ministry of Agriculture, Natural Resources and Rural Development (MARNDR) and the United Nations Food and Agriculture Organization (FAO) to address the problems of malnutrition, food insecurity, low income and poverty. The innovation consisted of improving flock performance through the introduction of exotic cock species well known for better body weight and egg production, local hen subsidies, training on disease control and farm management, training of community vaccinators and the organisation of vaccination campaigns, construction of coops to limit predators and technical backup from the technicians of MARNDR.

The present study was therefore meant to assess this intervention with the intention of establishing the socioeconomic context of the support, performance of family poultry (chicken) units put in place, the food security and economic viability of the family poultry enterprises in the Southern and Artibonite departments of Haiti as well as the sub-sector development challenges. Primary and secondary data collected from 132 respondents, nine months field data from MARNDR and 9 family poultry (chicken) enterprises were analysed using excel and STATA version 10.

The findings showed that the intervention targeted a higher proportion (57.6%) of poor households with a mean monthly non-food expenditure of \$50.46, mean monthly food expenses of \$116.9 and an average household size of 4.1. An absolute majority of male respondents own land in the corresponding ranges above 0.40ha with most female respondents having less than 0.4ha. Coops are constructed around homesteads that also serve as scavenging areas for birds as the rearing system is mostly extensive with grain supplemented three (3) times a day. An average of \$41.6 are spent on medication, vaccination and feed put together. Medication and vaccination expenses stood at an average of \$2.1 whereas coop construction expenses were \$78.1 on the average.

The current flock size for an average respondent consists of 3 cocks, 7 hens, 5 cockerels, 13 chicks and 6 pullets with no significant difference between the new and old project participants. Departmental differences were observed as the number of eggs laid per local hen in Artibonite is

significantly different and greater ( $P < 0.01$ ) than those of local hens in the South department. Also, the clutch size and number of eggs hatched are significantly different and greater ( $P < 0.01$ ) than those in the South department. The average number of eggs laid per cross-breed hen (14.25) is significantly different and (36%) higher than those laid by local hens (10.48) at  $P < 0.01$ .

The birds of the exotic and local hen crosses had a better body weight hence a better market value than those of pure local hens. However, the exotic and local hen crosses were not different from the crosses of rustic birds as far as broodiness and raising of chicks are concerned. The gross margins for family poultry husbandry ranges from \$74-\$429 with a net margin of \$27-\$226. Family poultry is therefore profitable irrespective of whether it is the scavenging or semi-intensive system.

The net margin represents 7.3%, 3.2% and 2.2% of non-food, food and (non+) food household monthly expenditures well above those of the newly recruited participants respectively. The gross margins account for 13.1% and 5.7% of the non-food and food expenses respectively with project participants still faring better than the newly recruited participants. Furthermore, the analysis of the number of eggs (96) disposed of each year by a respondent shows that an average of 39, 39 and 18 eggs were sold, consumed or given out by an average respondent. Meanwhile, the project participants were better off as the number of fowls sold or given out were significantly ( $P < 0.05$ ) higher than those sold or given out by the newly recruited counterparts.

The performance of family poultry (chicken) husbandry and its contributions to the welfare of the rural poor in Haiti could be significantly improved upon if constraints of the sub-sector are addressed. Measure should be taken to reduce the primary constraint which happens to be bird mortality through the institution of a sustainable vaccination system, ensure farmers adopt appropriate bio-security and management practices, construction of coops that could withstand Natural disasters, regular follow-up coupled with facilitating access to inputs (vaccines, drugs, feed). Meanwhile, further research is required to identify high productive rustic hens that could be coupled with the introduced exotic birds for a better performance.

## 1 Context and justification

Haiti is considered as the poorest nation in the Caribbean. Poverty is widespread nationally without rural and urban distinction as it is the case in most developing nations. This is particularly so as 82% and 69% of the rural and urban dwellers respectively live below the two dollar poverty line per day (Egset and Sletten, 2003) without gender differences (Jadotte, 2006). The situation is even more critical today following the earthquake hazard in January 2010. Food insecurity is common and has risen over the years. The depth of hunger or food deficit of the undernourished population increased from 400 to 430 kcal/person/day in 2000 and 2006 respectively. Moreover, FAO statistics (2010) show that the average dietary protein intake in Haiti from 2003-2005 remained very low and stood at an average of 42g/head/day; – a similar status as in the 90s. Furthermore, the Haitian ministry of plan and external cooperation (MPCE) estimates that 72% of children below the age of 5 years in 2004 end up dying, malnutrition being one of the eminent causes. Malnutrition is common especially among the children below 5 years. In fact, 50% of children below 5 years of age suffer from malnutrition and particularly low protein intake.

Family poultry has been increasingly recognized as one of the *entry points to address the problems of malnutrition, food insecurity and poverty* as a whole. In fact, Gawande et al. (2007) and Dei et al. (2009) argue that family poultry is a profitable venture and eventually a tool for livelihood improvement and poverty alleviation (Fasina et al., 2007; Sharma, 2007). Family poultry accounts for 19–50% of rural family income (Sonaiya, 2007) especially for the landless (De Lasson & Dolberg, 1985) and women who are very active in family poultry husbandry. This does not only empower women financially (Riise et al., undated) but go a long way to improve the educational and nutritional status of children (Pitt et al., 2003) by way of resulting income and intake of poultry and eggs. However, Laroche and Awono (2008) argue that highly preferred local chicken in Port-Au-Prince (Haiti) risk extinction because of complete dependence on imported chicken essentially from the United States and the Dominican Republic. The authors also argue that rustic local chicken have a cultural value in Haiti especially for the Voodoo ceremonies, annual (ancestral and Christian) ceremonies in addition to “*cock combat competitions*”. Hence, family poultry (essentially chicken) rearing was and is still the major livestock rearing activity carried out by 95% of rural households in Haiti (MARNDR, 2007).

The demonstrated potential of family poultry to address the persistent problems of food insecurity, malnutrition and poverty especially among women and children explains why it is one of the strategic lines of action for the government of Haiti. The current family poultry production, estimated at four millions birds, is largely insufficient to meet domestic demands partly satisfied by importing 12.6 millions of chicken annually (MARNDR, 2010). In order to support the food insecurity reduction agenda and following the request of Haitian government, FAO and the Organisation of Petroleum Exporting Countries (OPEC) provided technical and financial support for the promotion of Small-scale poultry husbandry and inland fish farming geared at improving food security in Haiti since 2002 till date. The support to promote smallholder family poultry husbandry in Southern and Artibonite departments covered three important periods (excluding extensions and/or delays) from September 2002 – October 2004 (phase I), 2005 to July 2006 (phase II) and February 2009 - July 2010 (extended to December) respectively.

Crespi and GuerneBleich (2005a and 2007b) on basis of the project completion, progress and evaluation reports revealed that a wide range of services were offered during the three phases of the intervention. Exploited reports, discussions with stakeholders including the farmers, the staff of the National Food Security Programme (NFSP) acknowledge the delivery of these services. This consisted of building the capacities of smallholder farmers, extension workers, veterinary officers, community volunteer vaccinators and partner institutions on specialised areas crucial for the development of family poultry in the selected regions. Vaccination campaigns were organised. Infrastructure (e.g. coops) and small material support also characterized the services offered to the farmers during the intervention period. Exotic cocks (Plymouth, Leghorn and Rhode Island Red breed roosters), support for indigenous hens and feed supplements were equally provided to farmers.

Despite the training, infrastructure, material support and the demonstrated importance of family poultry in the fight against malnutrition, food insecurity and poverty alleviation, the prevailing challenges, context, performance and sustainability of the intervention is questionable as efforts have not been devoted to clarify the latter and inform or advise policy makers on measures to take in order to develop the subsector. Moreover, these interventions were designed without reliable baseline information required to achieve desirable impact. Guèye (2003a) argues that family poultry projects failed because little attention is not paid to socio-

cultural issues and especially gender-based constraints. Similarly, Sonaiya (2005) also argues for the use of indigenous knowledge, an understanding of culture and society in order to assure food security contributions from family poultry. An analysis of the socioeconomic viability of family poultry based on an understanding of the innovation, local conditions will therefore guide policy makers and development agencies as a whole to better formulate family poultry development policies or intervention strategies. It may also serve the purpose of accountability and feedback to funders and tax-payers that allocated resources for family poultry policy intervention in Haiti over the three phases of the intervention. The objectives of the assessment were therefore as below.

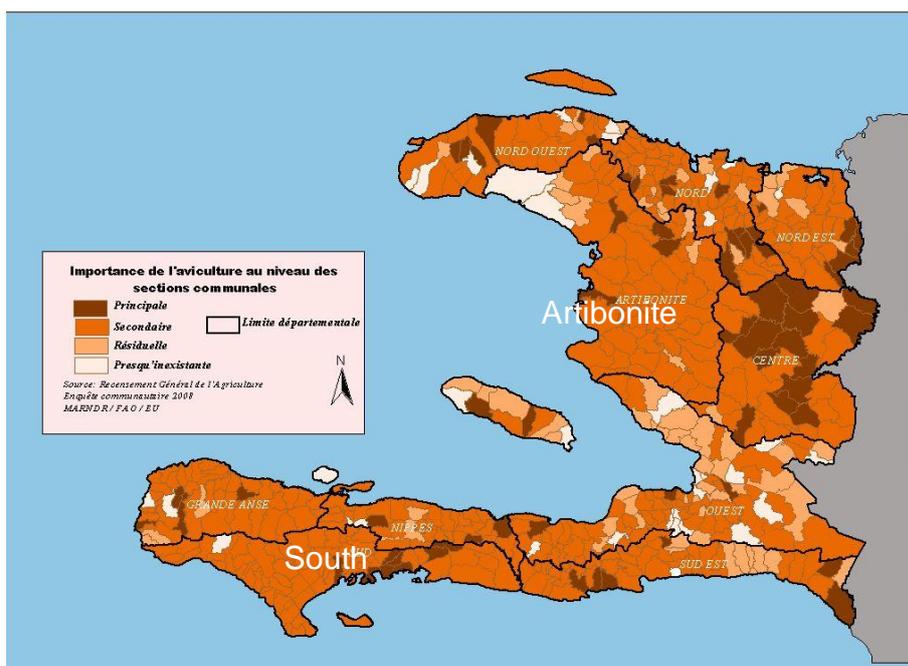
### **Objectives of the assessment**

- Determine the socioeconomic context of family poultry husbandry support in the Southern and Artibonite departments of Haiti
- Assess the performance of family poultry policy in the Southern and Artibonite departments of Haiti
- Determine the contribution of chicken rearing to family food security in the Southern and Artibonite departments of Haiti
- Determine the cost and returns of family poultry husbandry in the South and Artibonite departments of Haiti
- Identify the challenges of family poultry husbandry development husbandry in the South and Artibonite departments of Haiti

## **2 Methodology**

### *2.1 Study area*

The study was carried out in five of the twelve council areas in the Artibonite and South departments of Haiti where family poultry support intervention was provided (figure 1). The five council areas were chosen purposively to include capture departmental differences (if any), diversity of husbandry systems, introduced innovations (enhanced technical skills, housing and improved cocks) and areas of food deficiency. The choice of the council areas of the departments were also meant to ease reaching out to newly recruited program participants (control group).



**Source:**  
**Figure 1:** Family Poultry Map of Haiti showing surveyed departments of South and Artibonite

## 2.2 Data Collection

First, data were gathered from secondary sources such as project documents and reports principally from FAO (Haiti and Rome) offices, internet and stakeholder institutions in Haiti such as the NPFS (National Program for Food Security) coordination unit, VETERIMED and GERMALOT. A guide was used to gather information from groups and key informants respectively. Observation was also used to capture some of the information that could not have been captured either by group discussions or questionnaires. Primary data were collected from 59 (44.7%) newly recruited and 73 (55.3%) previous project participants (table 1) using structured questionnaires. Newly recruited project participants were those farmers selected to be part of the project one year ago and have not yet been provided the support offered by the project in terms of improved cocks, training and feed hence considered as the control group. The old farmers are those that were part of the previous two phases of the poultry support program some 2-8 years ago. These were considered as the treated group or old project participants.

**Table 1:** Category of persons interviewed by sex

<i>Status of respondent with project</i>	<i>Male</i>		<i>Female</i>		<i>Total</i>	
	<i>Freq.</i>	<i>Percent</i>	<i>Freq.</i>	<i>Percent</i>	<i>Freq.</i>	<i>Percent</i>
New project participants	46	34.8	13	9.8	59	44.7
Old project participants	37	28.0	36	27.3	73	55.3
<b>Total</b>	<b>83</b>	<b>62.9</b>	<b>49</b>	<b>37.1</b>	<b>132</b>	<b>100</b>

Socioeconomic data were randomly collected from 83(63%) males and 49(37%) females corresponding to a total of 132 respondents in 5 council areas as on table 2. These are areas where poultry support intervention took place or where participants have just been newly recruited and therefore have not yet benefitted from the advantages of the project. These council areas are found in two departments. The council areas (3) reached in the South department include Chantal, Toberck and Arniquet whereas those of Artibonite include Petit Rivière and Marchand Dessalines.

**Table 2:** Distribution of respondents by council area and gender

Council area	Men		Women		Total	
	Frequency	Percent	Frequency	Percent	Frequency	Percent
Petit Rivière	16	69.6	7	30.4	23	17
Marchand Dessalines	22	88.0	3	12.0	25	19
Chantal	14	87.5	2	12.5	16	12
Toberck	26	41.9	36	58.1	62	47
Arniquet	5	83.3	1	16.7	6	5
<b>Total</b>	<b>83</b>	<b>63.9</b>	<b>49</b>	<b>37.1</b>	<b>132</b>	<b>100</b>

Group discussions were equally organised with project participants, project drop outs and community vaccinators. Key farmers were also selected to include scavenging and semi-intensive systems of chicken husbandry. Economic assessments of the systems were made. The economic assessment of family poultry husbandry models based on the scavenging and semi-intensive systems (Guèye, 2003b) was done, discussed and adopted in collaboration with participants and technicians.

### *2.3 Data collected*

The socioeconomic data collected from the respondents include personal and household characteristics such as household size, marital status, sex, age, literacy level and main occupation. Data gathered on income and asset base include total monthly expenditure on food and non-food items, land holding, income from eggs & chicken. Family poultry enterprise inputs expenses (feed, medicines/vaccines, coop, labour birds...) and outputs (income from sale of birds, eggs and manure) were gathered. The prices of equipment and materials used were obtained from the local market closest to each site; the cost of labour was determined based on the prevailing rate at each site and as recommended by the government. Data on flock characteristics include the number of chicks, pullets, cocks, and performance of hens from laying of eggs to weaning. The challenges were obtained from other stakeholders both in the departments and the capital city, ministry of agriculture and institutions visited.

#### *2.4 Data analysis*

Data were analysed using STATA version 10 and excel spread sheet. Excel was used for the economic analysis of family poultry husbandry based on the partial budget method. Annual constant depreciation of assets essentially coops was applied. Gross margins, net income and related benefit-cost ratios for the family poultry enterprises were also determined. Triangulation of this analysis was made using data from key informants and data collected during the second phase of the poultry intervention in 2007. T-test and partial budget methods were used to determine mean differences and differences in proportion across the old project participants (treated) and control groups. The poverty profile of the respondents was determined using excel and the OECD poverty profile lines of \$1 and \$2.2586 respectively. Data collected through groups were analysed, validated during discussion sessions and used essentially in interpreting the survey data.

#### *2.5 Limitations*

One of the limitations of this study is related to the cross-sectional nature of the data collected. The longitudinal picture of the intervention could not be fully covered. However, some raw economic data for family poultry husbandry were used to triangulate the findings. Furthermore, the scope of the evaluation was broaden to include the consolidation of previous poultry experiences of other stakeholders due to the fact that the achievements of the current phase III were far below expectation at the time of this study. Consequently, the newly recruited participants were considered as the control group.

### 3 Results and Discussions

#### 3.1 Socioeconomic characteristics of respondents

##### 3.1.1 Income Generating Activities

The respondents reached from five different council areas in the Artibonite and South departments of Haiti carry out different activities for a living. The principle activity carried out by these respondents is agriculture as declared by 49.2% of the sampled population. This is followed by petty trading as reported by 26.5% of the respondents. Meanwhile, animal husbandry follows agriculture as the second major income generating activity as 32.5% of the respondents acknowledged this. Family poultry (chicken) husbandry was considered as the third major income generating activity by the respondents (table 3).

**Table 3:** Income Generating Activities (IGA) of respondents in Artibonite and South departments of Haiti

Activity	Major IGA		Second major IGA		Third major IGA	
	Frequency	Percent	Frequency	Percent	Frequency	Percent
Agriculture	65	49.2	36	30.0	9	11.0
Family poultry	2	1.5	10	8.3	29	35.4
Fishing	0	0.0	1	0.8	2	2.4
Rearing of other animals	10	7.6	39	32.5	25	30.5
Petty trading	35	26.5	19	15.8	6	7.3
Employment	11	8.3	9	7.5	5	6.1
Others	9	6.8	6	5.0	6	7.3
<b>Total</b>	<b>132</b>	<b>100</b>	<b>120</b>	<b>100</b>	<b>82</b>	<b>100</b>

The income generating activities are not different across the South and Artibonite departments. Rice and maize cultivation are some of the common agricultural crops grown by these respondents for a living. These crops also constitute the scavengeable resource base of the localities like *Marchang Dessaline*, *Chantal* and *Houck*.

##### 3.1.2 Educational level

An absolute majority of the respondents have at least a secondary level of education. Thirty eight point six (38.6) percent of the respondents have the primary level of education as opposed to 34.8% with secondary school level of education (table 4).

**Table 4:** Education of respondents by gender

<i>Level of education</i>	<i>Men</i>		<i>Women</i>		<i>Total</i>	
	Frequency	Percent	Frequency	Percent	Frequency	Percent
Primary	32	62.7	19	37.3	51	38.6
Secondary	35	76.1	11	23.9	46	34.8
University	7	100.0	0	0.0	7	5.3
None	9	32.1	19	67.9	28	21.2
<b>Total</b>	<b>83</b>	<b>62.9</b>	<b>49</b>	<b>37.1</b>	<b>132</b>	<b>100</b>

Another 21.2% of the respondents, especially women, have never been to school at all. Women constitute an absolute majority representing 67.9% of this last category. In short, the proportion of men in each educational category or level is by far absolutely higher than that of the female counterparts.

### 3.1.3 Marital status

Forty seven point seven (47.7) percent of the respondents, dominantly men (69.8%), are married. This is followed by cohabiting (29.5%) as on table 4. Men dominate in this category as 76.5% of the latter cohabite with their female counterparts. Discussions held with key informants claim that this practice is common as coping mechanisms to overcome ones legal obligations and freedom. These obligations are legal matrimonial responsibilities visa-à-vis partners as well as caution to permit freedom in a situation where matrimonial relationships are strenuous. This was more common in the South department where 56.4% cohabiting respondents were recorded as opposed to 43.6% in Artibonite.

**Table 5:** Marital status of respondents by gender

<i>Category</i>	<i>Men</i>		<i>Women</i>		<i>Total</i>	
	Frequency	Percent	Frequency	Percent	Frequency	Percent
Married	44	69.8	19	28.2	63	47.7
Divorced	13	76.5	4	23.5	17	12.9
Widow(er)	3	50	3	50	6	4.5
Separated	1	14.3	6	83.7	7	5.3
Cohabiting	22	56.4	17	43.6	39	29.5
<b>Total</b>	<b>83</b>	<b>62.9</b>	<b>49</b>	<b>37.1</b>	<b>132</b>	<b>100.0</b>

### 3.1.4 Household characteristics, poverty profile and land holding

The female and male respondents interviewed show some similarities and differences in their household characteristics, poverty profile and land holdings (table 5). First, the mean age of respondents does not differ between female and male respondents and stands at 51.2 years. This

gender difference does not also exist as concerns mean values of monthly non-food expenses (\$50.46), monthly savings (\$84.03), household size (4.1) as well as the number of children less than 18 years of age.

**Table 6:** Household characteristics, financial and land holdings of respondents (n=132)

<i>Description</i>	<i>Men</i>			<i>Women</i>			<i>Over all</i>		
	Obs. (n)	Mean	Std. Dev.	Obs. (n)	Mean	Std. Dev.	Obs. (n)	Mean	Std. Dev.
Age (years)	82	51.1	13.4	48	51.4	10.4	130	51.2	12.34
Household size	83	6.3	3.4	49	6.2	2.5	132	6.3	3.09
Adults (number)	83	4.2	2.7	49	3.8	1.6	132	4.1	2.34
Children below 18 years	59	2.9	1.5	41	2.8	1.7	100	2.8	1.58
Children below 5 years	20	1.7	0.6	15	1.2	0.4	35	1.5	0.56
Monthly food expenses (\$)	83	124.5 <sup>a</sup>	2.5	49	105.7 <sup>a</sup>	2.3	132	116.9	0.06
Monthly non-food expenses (\$)	83	53.4	2.6	49	45.6	2.8	132	50.46	0.07
Monthly Savings (\$)	46	98.3	3.4	29	66.0	2.5	75	84.03	0.08
Land size (ha)	76	1.1 <sup>a</sup>	0.2	44	0.7 <sup>a</sup>	0.2	120	0.92	0.25

<sup>a</sup>Not significantly different at  $P < 0.05$

Nevertheless, no significant difference ( $P < 0.05$ ) was found between men and women as concerns monthly food expenses and land holdings. The mean monthly food expenses for men (\$124.5) is not significantly higher ( $P < 0.05$ ) than the corresponding monthly food expenses for women (\$105.7). Though, 15% higher than the monthly food expenses for women, no significant difference was established. Similarly, the average land holding of men that stands at 1.1ha is not significantly ( $P < 0.05$ ) greater than the average land size declared by women (0.70ha). This ownership of land is further decomposed by sex (table 7).

Table 7: Land holdings by sex

<b>Land size (ha)</b>	<b>Men</b>		<b>Women</b>		<b>Total</b>	
	Frequency	Percent	Frequency	Percent	Frequency	Percent
≤ 0.40	17	48.6	18	51.4	35	26.5
0.41-0.80	11	61.1	7	38.9	18	13.6
0.81-1.20	16	72.7	6	27.3	22	16.7
>1.20	39	68.4	18	31.6	57	43.2
<b>Total</b>	<b>83</b>	<b>62.9</b>	<b>49</b>	<b>37.1</b>	<b>132</b>	<b>100.0</b>

Table 7 shows that an absolute majority of male respondents declared owning land in the corresponding ranges above 0.40ha. On the other hand, a majority of the female respondents (51.4%) declared having land in the range of 0.40ha or less. On a general note, most of the respondents (43.2%), essentially men, own land that is above 1.20ha. However, it is worth noting that Sletten and Egset (2004) concluded that poverty in Haiti is not determined by

differences in household characteristics and land ownership but rather by geographical factors like location characterized by climatic conditions, lack of infrastructure, soil erosion, etc.

In order to answer the question as to whether the participants reached were the vulnerable segment of the population targeted, an attempt was made to establish the poverty profile of the respondents. The differences recorded as concerns the land holdings and monthly food expenses were further enhanced by the poverty profile of the respondents. The profile took into consideration the (non-) food expenditure as well as the household size hence daily per capita expenditure analysed following the OECD (Organisation for Economic Co-operation and Development) measures. In fact, the poverty profile, as per the OECD \$1 line, shows that only 26.5% of the respondents interviewed are poor. A similar analysis using the OECD 2.2586\$ poverty line revealed that 57.6% of the respondents retained are poor. This poverty headcount is not the same between men and women interviewed. The analysis revealed that for the 1\$ OECD poverty line, 51.4% of the poor respondents were women. On the other hand, the OECD 2.2586\$ poverty line rather revealed that only 40.8% of the poor were women against 59.2 for men. Therefore, the proportion of poor reached is 26.5% or 57.6% for OECD \$1 and \$2.2586 poverty lines respectively. Thus, an absolute majority of project participants targeted are poor as far as the OECD \$2.2586 poverty line is concerned. There is no gender discrimination as far as poverty is concerned among women and men alike.

### *3.2 Characteristics of family poultry husbandry*

#### *3.2.1 Innovation, rearing system, feeding and vaccination*

The major innovation to family poultry farmers in the departments of South and Artibonite was the introduction of exotic cock species well known for better body weight and egg production. Table 8 shows the cock species and corresponding departmental distribution introduced to these farmers such as Plymouth, Rhode Island Red (RIR), leghorn and the crosses of the latter.

Table 8: Species of cock support provided to participants by department

Cock species support	Artibonite		South		Total	
	Freq.	Percent	Freq.	Percent	Freq.	Percent
None	14	40.0	21	70.0	35	26.5
Plymouth	13	43.3	17	56.7	30	22.7
Rhode Island Red (RIR)	2	100.0	0	0.0	2	1.5
Naked-neck cock	0	0.0	2	100.0	2	1.5
Leghorn RIR cross	0	0.0	40	100.0	40	30.3
Plymouth, leghorn and RIR	0	0.0	4	100.0	4	3.0
Local cocks	19	100.0	0	0.0	19	14.4
<b>Total</b>	<b>48</b>	<b>36.4</b>	<b>84</b>	<b>63.6</b>	<b>131</b>	<b>100.0</b>

These species and their descendants are essentially reared following the scavenging system alongside local birds owned by the respondents. However, a few farmers were given more than one cock species. For instance, in the South department, some farmers were offered three cock species notably Plymouth, Leghorn and RIR. Apart from exotic breeds, local cocks were also selected and offered to farmers in the Artibonite department as 14.4% of the respondents fall in this category. This was confirmed by the technicians who happened to have been part of the present and previous phases of the project.

In addition to exotic cock species, health awareness was created in the beneficiaries in an attempt to contribute to reducing mortality hence increase in flock size. Minimal support was provided to them to construct coops and vaccination campaigns organised following the training of community vaccinators. More so, the farmers were provided 5 kilograms of concentrate once offered exotic or local cocks. The extent at which these innovations were put into use by the project participants in the two departments are found on table 10.

Table 9: Housing, predators and chicken health

Variable	Newly recruited			Old project participants			Significance level
	Obs.	Mean	Std. Dev.	Obs.	Mean	Std. Dev.	
Av. Number of birds vaccinated in the past year	37	10.9	2.5	51	21.9	2.4	0.0004*
Expenditure on medication, vaccination and feed (\$)	57	39.1	3.0	70	43.8	3.3	0.5819
Expenditure on medication and vaccination only (\$)	36	1.3	2.9	51	2.9	3.0	0.0008*
Number of birds lost due to predators	36	10.9	2.4	51	15.0	2.8	0.1298
Expenditure for coop construction (\$)	54	62.3	3.5	68	78.2	2.5	0.2434

\* Significant at  $P < 0.01$

The analysis shows that the project participants recognise the importance of vaccination given the fact that the number of birds (21.9) vaccinated per year by each of the latter are significantly higher than those of average newly recruited beneficiaries (10.9) at  $P < 0.01$ . The mean cost of vaccination per bird for both the control group and beneficiaries is approximate USD 0.13 with a significant difference on expenses related to medication and vaccination between the two groups at  $P < 0.01$  (Table 9). This is an indication that if a sustainable vaccination system is put in place, the beneficiaries could pay for the services as it was the case with spotted vaccination services provided by the trained community vaccinators and private institutions like VERTERIMED. These farmers also spend some money to buy small quantities of relatively scarce and expensive feed alongside medication and vaccination services with no significant difference established between the participating and control groups.

Moreover, the mean expenditure per respondents for medication, vaccination and feed for the department of Artibonite was USD 35.2 hence lesser than that of the South (USD 45.6) where the third phase of the project was focused (table 10). Annual vaccination and medication expenses put together were relatively small as the latter stood at \$4 for Artibonite and \$1.3 for the South departments respectively. That of the south province is certainly smaller because of the subvention provided by the project as efforts were all focused in the area during the one year period under consideration. The average number of birds vaccinated by each of the respondent was approximately the same for both departments unlike the coop construction expenses that were higher for the Artibonite respondents than those of the South department (table 10).

Table 10: Differences in housing, vaccination scheme and mortality across departments

<i>Description</i>	<i>Artibonite</i>			<i>South</i>			<i>Overall</i>		
	Obs.	Mean	Std. Dev.	Obs.	Mean	Std. Dev.	Obs.	Mean	Std. Dev.
Av. Number of birds vaccinated	23	24.6	2.6	65	14.1	2.5	88	16.3	2.6
Expenditure on medication, vaccination and feed	45	35.2	4.3	82	45.6	2.5	127	41.6	3.1
Expenditure on medication and vaccination	23	4.0	3.4	64	1.6	2.8	87	2.1	3.2
Number of birds lost by predation	28	13.6	2.4	59	13.0	2.8	87	13.2	2.7
Expenditure on coop construction	45	90.3	2.8	77	61.3	2.9	121	78.1	2.3

On a general note, the average number of birds vaccinated by each respondent over the past one year was 16.3. An average of \$41.6 were spent for medication, vaccination and feed put together. On the other hand, medication and vaccination accounted for an average of \$2.1 and

coop construction expenses stood at \$78.1. Sixty two (62) percent of respondents' birds spent the night in the coops constructed for this purpose under the impulsion of the project. However, 31% of the respondents still have their birds sleeping on tree tops despite the investment made to provide the birds with shelter. This category of respondents uses the coops for purposes other than the one intended. The rest (7%) have their chicken sleeping in their homes.

### 3.2.2 Flock characteristics

The findings of the survey showed that each respondent currently has an average of 3 cocks, 7 hens, 5 cockerels, 13 chicks and 6 pullets (figure 2). This puts the total number of birds reared by an average household at 34 with cock-to-hen ratio of 3:7 on the average respectively. Apart from the number of hens and cocks, the number of chicks, pullets and cockerels at the disposal of the farmers at the time of the survey are higher than the nine months mean recorded in 2007 (figure 2).

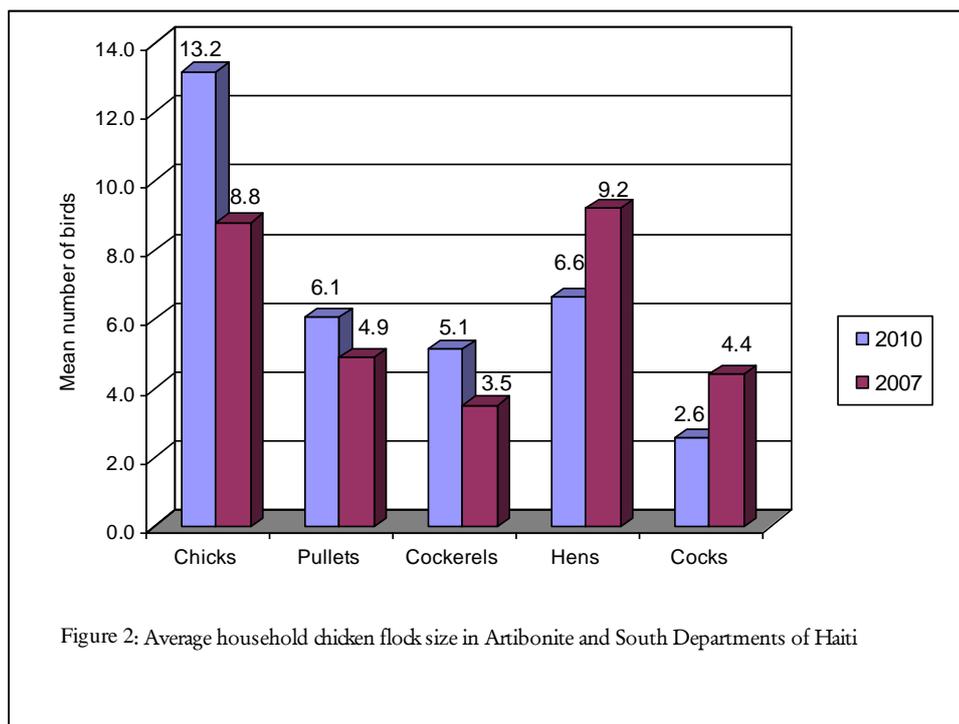


Figure 2: Average household chicken flock size in Artibonite and South Departments of Haiti

However, this is tricky as the 2007 figures are averages taken over a period of nine months and under different management, health and climatic conditions. The flock size changes from one month to the other (figure 3). For instance, the number of cocks in September 2007 was six as opposed to 3 in February that same year. The flock size appears to be lower between the months of March and April as could be seen on figure 3.

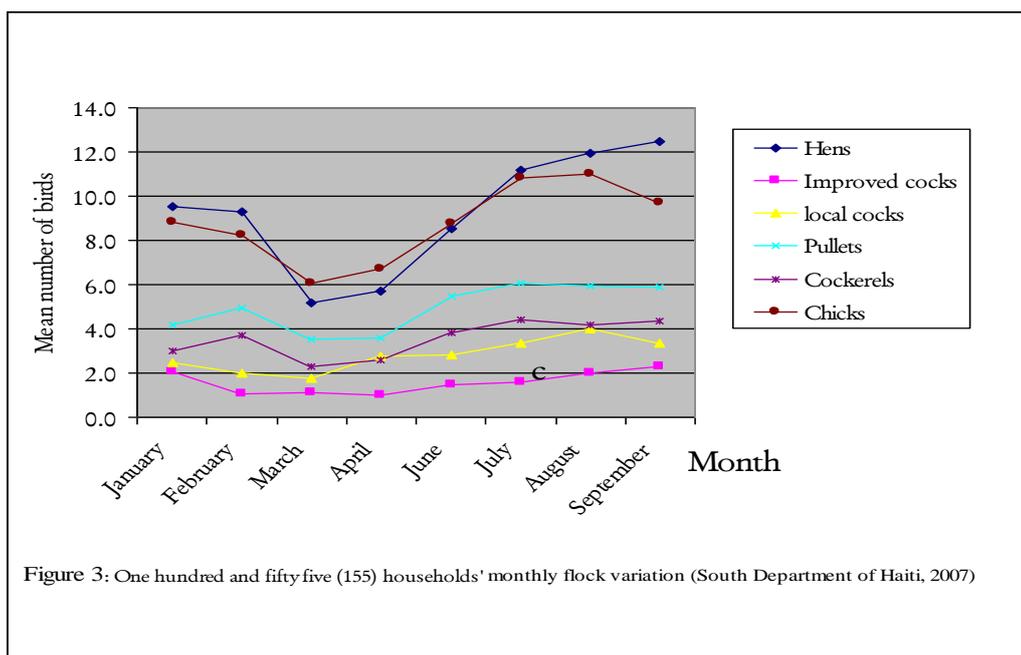
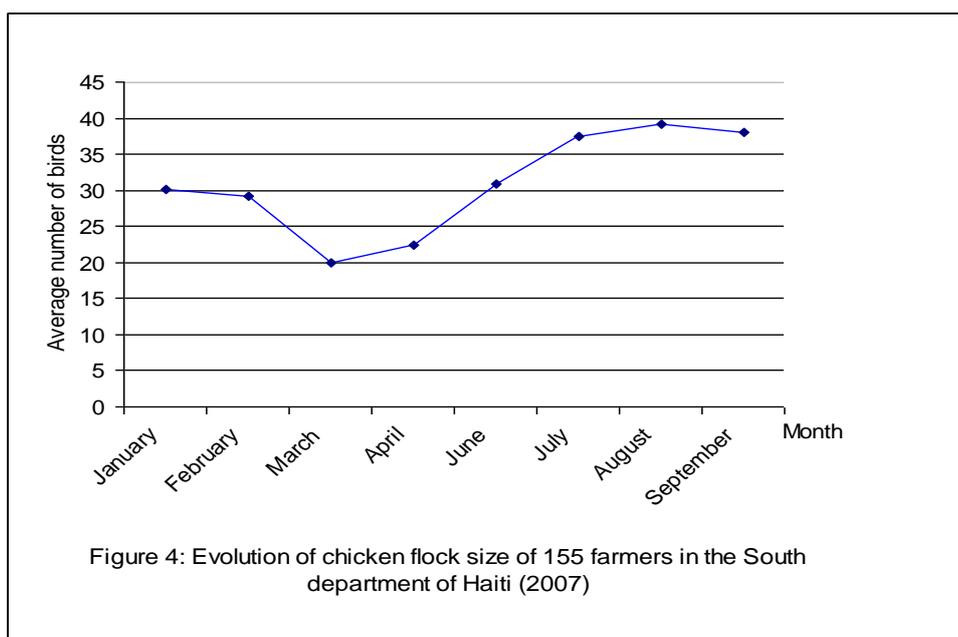


Figure 3 : One hundred and fifty five (155) households' monthly flock variation (South Department of Haiti, 2007)

The months of June and July stand out to be months where the flock size increases by 30-50% (figure 4). This percentage increase falls progressively and stagnates in September. The increase or decrease in flock size could be explained by disease outbreak, consumption and sales made by the households. For instance, April and November are known periods for Newcastle disease outbreaks as testified by key informants contacted and farmers during group discussions. Mortality is highest in July following the increase in flock size with an average of 13 birds lost due to predators. Also, the flock size starts reducing in the month of September because the farmers make most of their sales (5 birds) in June, July and August as they have to provide for the school needs of their children.



**Figure 4 :** Evolution of chicken flock size of 155 farmers in the South department of Haiti (2007)

**Source:** Drawn by author using data from NPFS, 2007

It was also established during group discussions that December is one of the peak moments when farmers make most of their sales. However, there is an end of year Newcastle Disease outbreak around November each year. December is a period when birds are sold at relatively better prices as the demand is high given the end of year festivities. These trains are useful when it comes to training the farmers on management issues as it is common to find farmers keep birds just to sell at this period of the year without necessarily considering the economic implications.

The analysis of the number of birds at the disposal of recently recruited and old participants show no significant differences even though the number of each category of birds owned by the latter was slightly higher than that of the former (table 11).

**Table 11: Mean differences in flock characteristics between recently recruited and old project participants**

Description	Newly recruited participants (n=45)			Old participants (n=65)			Diff.	Significance level
	Mean	Std. Err.	Std. Dev.	Mean	Std. Err.	Std. Dev.		
Number of chicks	12.72	1.41	8.82	13.46	1.31	10.07	-0.74	0.71
Number of pullets	6.24	0.75	4.63	5.95	0.62	5.01	0.28	0.78
Number of cockerel	6.00	0.83	5.03	4.63	0.49	3.82	1.37	0.13
Number of hens	6.49	0.63	4.20	6.75	0.63	5.05	-0.26	0.78
Number of cocks	2.45	0.46	2.57	2.62	0.26	1.89	-0.16	0.74

However, this was a cross-sectional survey and the dynamic nature of the flock size over the year must be kept in mind as shown on figure 4. The coops are under exploited as the mean size of 16.1m<sup>2</sup> does not take the optimum number of birds let alone entirely used for the purpose for which it was intended.

### 3.3 Performance of family poultry husbandry

The average number of eggs laid per cross-breed hen (14.25) is significantly different and higher than those laid by local hens (10.48) at  $P < 0.01$  as on table 12. This is 36% higher than the number of eggs laid by each local hen. This analytical conclusion is the same drawn following, discussions with groups and key informants. Moreover, the weight and size of eggs laid by the cross-breed hens appear to be greater than those of the local hens. As would be seen under the section on the economic importance of family poultry, these eggs have a better market value especially as the farmers consider this to be “improved”. This is considered improved because these eggs, when hatched, could provide birds of better body weight than those from the local eggs.

**Table 12: Mean differences in the performance of improved and rustic hens (n=108)**

Performance	Improved Hens			Local Hens			Diff.	Significance level
	Mean	Std. Err.	Std. Dev.	Mean	Std. Err.	Std. Dev.		
Number of eggs laid per hen	14.25	0.73	5.31	10.48	0.21	2.16	0.59	0.00***
Clutch size (eggs)	9.22	0.32	2.24	8.86	0.22	2.30	0.36	0.36
Number of eggs hatched/clutch/hen	7.25	0.32	2.25	7.51	0.20	2.05	-0.26	0.48
Number of chicks raised per hen	5.68	0.42	2.86	5.75	0.21	2.18	-0.07	0.87
Number of surviving chicks up to maturity	4.47	0.33	2.26	4.92	0.20	2.08	-0.45	0.23
Clutches per hen/year	3.38	0.15	1.06	3.52	0.11	1.18	-0.14	0.47

\*\*\* Significant at  $P < 0.01$

Despite the significant difference in the number of eggs, the clutch size is approximately the same for both the local and cross-breed hens. The number of eggs hatched and chicks raised show no significant differences between these two categories of birds. Similarly, the numbers of clutches per hen each year as well as the number of chicks raised show no significant differences. This is appealing as the perception by the farmers is that “*improved hens are better layers and not better mothers*”. This is why some farmers prefer to have the eggs from cross-breed

hens hatched by the local hens. Similarly, a few others rather rear the cross-breed hens as layers and the eggs given to broody local hens. Though it is not yet the case, this is not strange to Sørensen (No year) who argues that hatchability, high egg yield and broodiness are antagonistic traits. Domestic hens bred for high egg production have more or less lost their ability to become broody. Consequently, if the cross-breed hens are reared for high egg production, thoughts might be given to incubation facilities. It may be necessary to capitalise on this to provide alternative means of incubation as the cross-bred hens provides the household with a greater number of eggs at a similar hatchability level as the local hens.

After controlling for departmental differences, it came out that the performance of the local hens in Artibonite are better than their counterparts in the South department (table 13). This is particularly the case as the number of eggs laid per local hen in Artibonite is significantly different and greater ( $P < 0.01$ ) than those of local hens in the South department. Similarly, the clutch size and the number of eggs hatched are significantly different and greater ( $P < 0.01$ ) than those in the South department. Moreover, the number of annual clutches per local hens in Artibonite appears to be higher and significantly ( $P < 0.05$ ) better than those of the South department (table 13). Garcia-Lopez et al. (2007) argued for these potentials in Haiti as they concluded that *Creole* hens have a good potential to supply animal protein in terms of meat and eggs to rural areas.

Performance differences across geographical boundaries in Assam (India) were reported by Gawande et al. (2007). The causes for the difference were partly explained by the management system that differs across the regions. However, observations made on the field showed that the birds in Artibonite had better body weights than those of the South. The significant differences in these traits are indications that some species of local hens perform better than others across departmental boundaries. It may therefore be necessary to exploit and incorporate this indigenous potential in Artibonite and other departments for the development of family poultry.

**Table 13: Mean Departmental differences in the performance of local, exotic and cross-breed hens**

<i>Trait</i>	<i>Artibonite</i>				<i>South</i>				<i>Sign. level</i>
	<i>Obs.</i>	<i>Mean</i>	<i>Std. Err.</i>	<i>Std. Dev.</i>	<i>Obs.</i>	<i>Mean</i>	<i>Std. Err.</i>	<i>Std. Dev.</i>	
<i>Performance of local hens</i>									
Number of eggs laid per local hen	46	11.5	0.4	2.8	64	9.9	0.2	2.0	0.00***
Clutch size (eggs) per broody local hen	46	10.5	0.5	3.1	64	8.0	0.2	1.7	0.00***
Number of eggs hatched/clutch/local hen	46	8.5	0.4	2.6	65	7.0	0.2	1.8	0.00***
Number of clutches per local hen/year	46	4.2	0.4	2.8	65	3.3	0.1	0.9	0.02**
Number of chicks raised per local hen	46	6.2	0.4	2.6	65	5.5	0.2	2.0	0.10
Number of surviving chicks up to maturity		5.3	0.4	2.7	65	4.8	0.2	1.7	0.17
<i>Performance of improved hens (exotic cock X local hens)</i>									
Number of eggs laid per improved cock descendant hen	19	17.1	1.3	5.6	37	12.9	0.8	4.6	0.00 <sup>a</sup>
Clutch size (eggs) per broody improved cock descendant hen	15	10.6	0.7	2.6	36	8.5	0.3	1.8	0.00 <sup>a</sup>
Number of eggs hatched/clutch per improved cock descendant hen	15	8.1	0.8	3.0	35	6.9	0.3	1.7	0.07 <sup>a</sup>
Number of clutches per improved cock descendant hen/year	14	3.9	0.6	2.2	37	3.4	0.2	1.0	0.31 <sup>a</sup>
Number of surviving chicks of improved cock descendant hens up to maturity	13	6.5	1.0	3.6	37	5.4	0.4	2.5	0.24 <sup>a</sup>
Number of chicks raised per improved cock descendant local hens	13	5.2	0.9	3.1	36	4.4	0.3	2.0	0.27 <sup>a</sup>

<sup>a</sup> Too small (n) for any meaningful difference and conclusion ; \*\*\*, \*\*Significant at P<0.01 and P<0.5

Meaningful conclusions could not be drawn as concerns the differences that exist between the exotic and local crosses across departmental boundaries because the observations were fewer. However, there are possible indications that family poultry in Artibonite like other unidentified departments could be useful in the development of the subsector.

Nevertheless, it must be noted that farmers are conscious that the exotic and local hen crosses have a rapid growth and maturity history, better body weight, sales at better prices and lays more eggs than the rustic chicken. These benefits do not convince the farmers in adopting the innovation fully. They still have a preference to rearing local hens because they resist to disease, pests and rains, have a better taste, eats everything, good at brooding and raising chicks, lays nutritive eggs with far reaching longevity than the exotic and local hen crosses. Another reason is that the local cocks are small in size and smarter hence better *combat cocks*<sup>1</sup>.

<sup>1</sup> “cock fighting” is a widespread game in Haiti that fetches a lot of money to the gamblers essentially men

### 3.4 Food security and economic importance of family poultry husbandry

The ultimate goal of the family poultry component of the National Program for food security (NPFS) was to improve on household food security, income and protein intake of participants in particular and the communities in general. This coincides with the reasons provided by respondents for family poultry husbandry. In fact, 74% of the respondents argue that chicken husbandry was primarily intended to raise income (table 14). The second main reason - household consumption, was advanced by 68% of the respondents. In addition to the previous reasons, 53% of the respondents feel this activity is barely for leisure. This category of respondents certainly makes most of their money out of alternative income generating activities like petty trading and farming.

**Table 14: Reasons for family poultry husbandry**

Reason	Main reason		Second main reason		Third main reason	
	Freq.	Percent	Freq.	Percent	Freq.	Percent
Revenue	98	74.2	26	21.1	5	8.1
Consumption	33	25.0	84	68.3	9	14.5
Festivals	1	0.8	1	0.8	15	24.2
Recreational activity	0	0.0	12	9.8	33	53.2
<b>Total</b>	<b>132</b>	<b>100</b>	<b>123</b>	<b>100</b>	<b>62</b>	<b>100</b>

In the paragraphs that follow, a thorough analysis of the extent to which family poultry contributes to improving respondents' household food security and income hence welfare.

#### 3.4.1 Benefit-Cost analysis of family chicken husbandry

In order to determine the average annual poultry income, the value of eggs and fowls sold, consumed or given out as gifts were estimated for the period running from September 2009 to September 2010 by the respondents. In some cases the data were collected from the records of farmers where they exist. The major areas of expenditure or investment necessary for running the poultry enterprises were also collected notably expenditure for coop construction, medication, vaccination and feed. Table 15 provides an analysis of estimated income and costs incurred over a period of one year.

The average annual (fixed) costs incurred in the rearing of birds under the scavenging system stood at USD 77.5 (table15). This cost represents 46% of the total expenditure per year whereas the expenditure on medication, vaccines and feed (variable cost) accounts for 54% of the annual expenses. The cost of constructing a coop was \$5.4 higher among old project participants than the control group. This is explained by the fact that the coops of old project participants were bigger in size than those of the recently recruited participants. On a similar note, data collected from 9 farmers in the project area puts the annualised cost at \$669. The fixed cost (FC) accounts for 42% of the annual expenditure with variable cost (VC) representing 58% of the latter (table 16). These expenses are determined based on spending in the construction of coops, purchase of feed mills, terrain ‘lease’ and stock of chicken. Upon analysis of field data collected in 2007 by the family poultry support staff, it was concluded that the average annual expenditure in running a chicken farm enterprise was estimated at \$63.1. This represents variable cost as the investment expenses were not tracked. These differences in fixed and variable costs observed from the survey, field and case study data is explained by the socioeconomic context of the chicken husbandry, management practices and investment in the enterprises.

On the other hand, the analysis of data collected by way of survey revealed that an average family poultry (chicken) rearer makes an annual income of USD 115.9 based on the assumption that the eggs and fowls consumed or given out as gift could equally have been sold at prevailing prices (\$ 0.11-\$0.25) at which eggs were sold over the years as provided by the respondents. Based on this working assumption, the analysed survey data show that an average farmer would get a gross margin of \$74.0 from the enterprise. On a general note, the net margin of an average farmer was positive and estimated at \$38.4 with project participants having far better net margin (\$48.8) than the newly recruited participants(\$27.3) (table 15). Positive net profits in poultry husbandry were also reported by Gawande et al. (2007)

**Table 15:** Mean annual income and expenditure for chicken enterprises in Artibonite and South departments of Haiti

(in USD) n= 127			
<i>Disposal method</i>	<i>Mean income of old project participants N= 70</i>	<i>Mean income of Newly recruited participants (Control) N= 57</i>	<i>Over all mean Income for both participants N= 127</i>
<b>Sold</b>			
Eggs	8.5	5.5	8.1
Fowls	52.7	31.5	41.6
<b>Total (sold)</b>	<b>61.2</b>	<b>37.0</b>	<b>49.7</b>

<i>Disposal method</i>	<i>Mean income of old project participants N=70</i>	<i>Mean income of Newly recruited participants (Control) N=57</i>	<i>Over all mean Income for both participants N=127</i>
<b>Consumed</b>			
Eggs	6.3	4.0	5.4
Fowls	37.7	38.1	38.1
<b>Total (consumed)</b>	<b>44.0</b>	<b>42.1</b>	<b>43.5</b>
<b>Gift</b>			
Eggs	3.0	1.8	2.5
Fowls	23.5	16.7	20.2
<b>Total (gift)</b>	<b>26.5</b>	<b>18.5</b>	<b>22.7</b>
<b>Grand Total income (a)</b>	<b>131.7</b>	<b>97.6</b>	<b>115.9</b>
<b>Expenditure</b>			
*Coop construction (FC)	39.1	31.2	35.6
Medication, Vaccine and feed (VC)	43.8	39.1	41.9
<b>Total average annual expenses (b)</b>	<b>82.9</b>	<b>70.3</b>	<b>77.5</b>
<b>Gross margin (a-VC)</b>	<b>87.9</b>	<b>58.5</b>	<b>74.0</b>
<b>Net Margin (a-b)</b>	<b>48.8</b>	<b>27.3</b>	<b>38.4</b>

NB: USD 1=40Gdes; \*Depreciation for 2 years

Similar conclusions were drawn from data collected from 9 local chicken entrepreneurs operating based on the scavenging and semi-intensive system in the South and Artibonite departments. The analysis in table 16 shows that an average chicken entrepreneur makes \$429 gross margin and a net benefit of USD 226. All the 9 farmers whose enterprises were studied either break-even or make profit without system boundary losses. The average benefit-cost ratio was 1.5 as a whole showing that smallholder chicken husbandry is a profitable venture. This ratio was up to 2.8 in another scavenging system-based enterprise. It will even be more profitable if the coops were fully exploited.

**Table 16:** Income and expenditure (\$) of 9 chicken enterprises in the South and Artibonite departments of Haiti

<i>Rearing System of each enterprise</i>	<i>Expenditure</i>					<i>Income and analysis</i>			
	<i>Total (a)</i>	<i>Fixed Cost (FC)</i>	<i>Variable Cost (VC)</i>	<i>% FC</i>	<i>% VC</i>	<i>Income (b)</i>	<i>Gross Margin (b-VC)</i>	<i>Net benefit (b-a)</i>	<i>Benefit-Cost ratio</i>
scavenging	273	128	145	47	53	761	615	488	2.8
scavenging	243	98	145	40	60	502	357	259	2.1
scavenging	445	205	240	46	54	667	427	222	1.5
Semi Intensive	850	393	457	46	54	1,063	606	214	1.3
scavenging	697	321	376	46	54	1,008	632	311	1.4
scavenging	433	226	207	52	48	622	415	189	1.4
Scavenging**	349	169	180	48	52	360	180	11	1.0

Scavenging**	220	99	121	45	55	243	122	23	1.1
Semi Intensive	2,512	191	2,321	8	92	2,827	505	315	1.1
<b>Average</b>	<b>669</b>	<b>203</b>	<b>466</b>	<b>42</b>	<b>58</b>	<b>895</b>	<b>429</b>	<b>226</b>	<b>1.5</b>

\*\*Enterprise has no coop

Under exploited coops as per data collected in 2007 by the project technicians also show family poultry enterprise average monthly gross margin was \$12.1 with an estimated annual gross margin of \$144.7 (table 17). The monthly gross margins were positive throughout the nine months period during which data were collected. However, these gross margins varied from one month to the other. The highest net gross margins were recorded in the months of February and July where the flock size was quite substantial.

**Table 17** : Monthly marginal income of family poultry enterprises in the South department of Haiti

Month	Expenditure (\$)	Total income (\$)	Marginal Income (\$)
January	8.6	19.7	11.2
February	6.8	23.8	17.1
March	6.0	16.8	10.9
April	5.7	16.9	11.2
June	5.1	16.6	11.6
July	4.9	24.8	19.8
August	5.0	19.7	14.7
September	5.4	17.5	12.1
<b>Mean</b>	<b>5.3</b>	<b>17.3</b>	<b>12.1</b>
<b>Total (period)</b>	<b>47.4</b>	<b>155.9</b>	<b>108.5</b>
<b>Estimated total</b>	<b>annual</b>	<b>63.1</b>	<b>207.8</b>
			<b>144.7</b>

**Source:** Determined using raw data from NPFS, 2007

The gross margins for family poultry husbandry ranges from \$74-\$429 with a net margin of \$27-\$226. The analysis shows a net positive income for family poultry enterprise irrespective of system and particularly better for the project participants. The support provided to the farmers over the years in the Artibonite and South departments of Haiti permitted the beneficiaries to earn more income estimated at USD21.2 well above the control group. The benefit-cost ratio ranged from 1.0 -2.8 with the overall of 1.5. However, more income could be earned by these farmers if the enterprise is properly managed, attention paid to vaccination, feeding, coops fully exploited and birds culled at appropriate moments.

### *3.4.2 Contributions of family poultry to welfare of participants*

Family poultry is one of the entry points in addressing the problems of malnutrition, food insecurity and poverty especially as Gawande et al. (2007) and Dei et al. (2009) argue that family poultry is a profitable venture. Thus, it is considered as a tool for livelihood improvement and poverty alleviation (Fasina et al., 2007; Sharma, 2007). The support in promoting family poultry (chicken) husbandry was meant to improve on the livelihood of participants. The fundamental issue is whether the innovation or support permitted the participants to improve on their welfare especially income.

The analysis of survey data and triangulation with routine data revealed that the participants and would be participants alike make profit in chicken husbandry irrespective of whether the system is scavenging or semi-intensive. As a whole, the gross margins ranged from \$74-\$429 with a net margin of \$27-\$226 per annum. The use of net margin broken down on monthly basis from table 15 and expressed as a percentage of (non-)food monthly expenditure shows that the chicken husbandry support could boost household food and non-food expenditure. In fact, the analysis shows that the net profit margin of the project participants is twice as much as that of those of the newly recruited participants. The net margins earned by participants represent 7.3%, 3.2% and 2.2% of non-food, food and (non)food household monthly expenditures respectively well above those of the newly recruited participants (table 18). Similar trends also hold with gross margins accounting for up to 13.1% and 5.7% of the non-food and food expenses respectively with project participants still faring better than the newly recruited participants. This is not surprising as the crosses of exotic and local hens had better body weights than the rustic ones. Similarly, the eggs resulting thereof were more sizeable and sales at better prices (twice as much) than the local hen derived eggs especially as they were considered “improved”.

**Table 18: Proportion of earned chicken income in monthly household, (non-)food expenditure and other earned livestock income**

<b>Poultry Revenue</b>	<b>Old project participant</b>	<b>New project participant</b>	<b>Overall participant</b>
<b>Mean net Margin/month (\$)</b>	<b>4.1</b>	<b>2.3</b>	<b>3.2</b>
As a percentage of monthly Food Expenses	3.2	2.3	2.8
As a percentage of monthly Non-food expenses	7.3	2.3	6.4
As a percentage of monthly (Non+) food expenses	2.2	1.6	2.0
<b>Mean Gross margin/month (\$)</b>	<b>7.3</b>	<b>4.9</b>	<b>6.2</b>
As a percentage of monthly Food Expenses	5.7	4.9	5.4
As a percentage monthly Non-food expenses	13.1	4.9	12.3
As a percentage monthly (Non+) food expenses	4.0	3.4	3.8
<b>Other yearly earned livestock income (\$)</b>	<b>171.8</b>	<b>149.1</b>	<b>161.6</b>
net margin as a % of other livestock income each year	28.4	18.3	23.8
Gross margin as a % of other livestock income each year	51.2	39.2	45.8

These surplus in family poultry earnings represent 23.8%-45.8% of income earned from the sale of other livestock by the respondents with project participants still taking a lead over the newly recruited participants. The earned net margin represents 28.4% and 18.3% of income earned each year from the sale of other livestock by old project participants and newly recruited participants respectively. The gross margin could represent as much as 51.2% of the other livestock sales by the project participants each year compared to 18.3% for newly recruited participants. This is an indication that the intervention had an added value to the participants' livelihood.

Some of the eggs laid by chicken were eaten, consumed or given out to friends and relatives as gifts. The number of eggs (96) disposed of each year by each respondent shows that an average of 39, 39 and 18 eggs were sold, consumed or given out by an average respondent each year. However, the number of eggs is still far below the recommended 180 eggs per year and the average of 250 eggs for developing countries (Sharma, 2007). Meanwhile, the project participants were better off as the number of fowls sold or given out were significantly ( $P < 0.05$ ) higher than those sold or given out by the newly recruited counterparts (table 19). These declarations were also crossed-checked with the performance of the hens as far as the number of eggs laid is concerned. This analysis showed that the average number of eggs set aside for sale, consumption or gift from each improved hen per laying cycle was five(5) or 17 per annum instead of one(1) per laying cycle or 6 per annum from each rustic hen. Some new dynamics also resulted whereby project participants tend to give out higher (but not significant) number of eggs to

friends and relatives than the newly recruited participants. Since the eggs were considered “improved”, it might also be that the eggs are introduced in friends’ or relatives’ flocks for hatching. Nevertheless, no significant difference was found as far as egg and fowl consumption is concerned probably because of the value attached to them especially as these were regarded as “improved” and sells at far reaching prices. For instance, the price of an “improved” egg was up to twice (\$0.25) the price of eggs derived from rustic hens (\$0.12). This was same for the bird crosses that were sold at up to twice (\$13.7) the price of rustic birds (\$6.2).

**Table 19: Mean number of eggs and fowls disposed by household per annum**

	Newly recruited participants				Old project participants				
	Obs	Mean	Std. Err.	Std. Dev.	Obs	Mean	Std. Err.	Std. Dev.	Sign. Level
Eggs sold	46	32.1	1.2	3.4	66	42.0	1.2	3.7	0.28
Eggs Consumed	46	32.1	1.2	3.4	66	42.0	1.2	3.7	0.28
Gift	32	13.4	1.2	2.8	48	21.1	1.2	3.4	0.09
Fowls Sold	36	6.0	1.1	2.2	40	9.0	1.2	3.1	0.04*
Fowls consumed	50	6.7	1.2	3.0	59	7.6	1.1	2.5	0.51
Gift Fowls	37	3.3	1.1	2.1	43	4.8	1.1	2.4	0.04*

\* Significant at  $P < 0.05$

In fact, the (small) additional income made from fowls and eggs were reported to have been used in meeting up with the school requirements of the children as well as some of the household (non-)food needs. The intervention therefore permitted the participants to make small improvements on their welfare and that of household as whole. Nevertheless, much could still be made as the egg production capacity of the birds was not fully exploited. Also, the flock size still remains very small for reasons explained in the paragraph that follows.

### *3.5 Challenges of family poultry husbandry*

The major challenge that hampers improvement in the family poultry husbandry in Haiti and the areas covered is the mortality of birds. This is principally due to the Newcastle Disease (ND) and other diseases like the Gumboro. The Newcastle disease outbreak occurs essentially at known periods in the year particular April and November in the project area. The vaccines and conservation facilities are not readily available at the grassroots making it difficult for the trained community vaccinators or specialised services of the MARNDR to make prompt and timely vaccination campaigns. Birds are therefore lost in their numbers due to diseases alongside

losses due to predators. This discourages farmers from increasing their flock size as they fear the diseases and predators would cause them enormous losses.

Natural disasters are also responsible for some of the losses incurred in family poultry farming in Haiti. The country and areas of intervention are exposed to natural disasters such cyclones, hurricanes and floods. Considerations need to be given to these disasters when it comes to making an appropriate choice of coop to construct.

Improved management has increasingly been recognized as a major handicap (Sharma, 2007) in improving family poultry through the introduction of exotic cocks. This is one of the major problems faced by the participants of the chicken farming program in the Haitian's departments of Artibonite and South. For instance, the birds are regularly left to scavenge around or sleep on tree tops despite the coops constructed and rehabilitated to shelter these birds. Furthermore, the bio-security measures are not also followed as the coops have multiple uses and are not disinfected hence loss of birds.

Access to inputs and particularly vaccines, drugs and commercial feed are stumbling blocks to the development of family poultry in the areas of intervention and Haiti in general. Feed, essentially supplied from the Dominican Republic, is expensive and not readily available. Birds therefore survive essentially on the scavengeable resource base and supplemented grains. This pushed Garcia-Lopez et al. (2007) to advocate for further research into the use of local feed resources available to hens in rural areas as an alternative to commercial feed.

The problem of marketing of chicken was also raised by the farmers as a limiting factor to the sub-sector. Despite the preference of local chicken meat and eggs, the marketing of these products face serious competition from those imported from the Dominican Republic and the United States of America that are far cheaper (Laroche and Awono, 2008).

The introduction of exotic chicken breeds to the farmers made a small improvement in the number of eggs laid by the hen crosses. However, these eggs are given to local hens for incubation based on the perception that the hen crosses are not good at incubation and raising of chicks. This expresses the necessity to consider incorporating a simple or an appropriate hatching technology in addition to the innovation brought to the farmers.

Financial resources are therefore required to adopt this technological package. This might not be easy to mobilize as the farmers are not only poor but consider access to financial resources a limiting factor to expanding the family poultry husbandry practices.

#### **4 Conclusion and policy recommendations**

The family poultry support provided to farmers in Artibonite and South departments of Haiti is a result of a partnership initiative between the Ministry of Agriculture, Natural Resources and Rural Development (MARNDR) and the United Nations Food and Agriculture Organization (FAO) as an entry points to address the problems of malnutrition, food insecurity, low income and poverty. This partnership covered three important periods (excluding extensions and/or delays) from September 2002 – October 2004 (phase I), 2005 to July 2006 (phase II) and February 2009 - July 2010 (now extended to December 2010) respectively. During this period, the farmers were provided innovative practices that could enhance the performance of family poultry husbandry units. The innovation consisted of improving flock performance through the introduction of exotic cock species (Plymouth, Leghorn and RIR) well known for better body weight and egg production, local hen subsidies were provided, training on disease control and farm management, training of community vaccinators and the organisation of vaccination campaigns, construction of coops to limit predators and technical backup from the technicians of MARNDR.

The objectives of this assessment were to establish the socioeconomic context of this family poultry support, performance of family poultry (chicken) units put in place, the food security and economic viability of the poultry units in the Southern and Artibonite departments of Haiti as well as the sub-sector development challenges. Primary and secondary data were collected from 132 respondents, nine months field data from MARNDR and 9 family poultry (chicken) enterprises. Data analysed using excel and STATA version 10 provided findings that could be useful for policy formulation and further development of the sub-sector in particular.

The findings showed that the intervention targeted a higher proportion (57.6%) of poor households under the OECD \$2.2586 poverty lines with no gender discrimination as far as poverty is concerned. These (would be) beneficiaries have a mean monthly non-food expenditure of \$50.46, mean monthly food expenses of \$116.9 with an average household size of

4.1. An absolute majority of male respondents own land in the corresponding ranges above 0.40ha with most female respondents having less than 0.4ha. The coops are constructed around homesteads that also serve as scavenging areas for birds as the rearing system is mostly extensive with grain supplemented three (3) times a day. An average of \$41.6 are spent on medication, vaccination and feed put together. Medication and vaccination expenses stood at an average of \$2.1 whereas coop construction expenses were \$78.1 on the average.

The current flock size for an average respondent consists of 3 cocks, 7 hens, 5 cockerels, 13 chicks and 6 pullets with no significant difference between the new and old project participants. Departmental differences were observed as the number of eggs laid per local hen in Artibonite is significantly different and greater ( $P < 0.01$ ) than those of local hens in the South department. Also, the clutch size and number of eggs hatched are significantly different and greater ( $P < 0.01$ ) than those in the South department. The average number of eggs laid per cross-breed hen (14.25) is significantly different and higher than those laid by local hens (10.48) at  $P < 0.01$  (36% higher than the average local hen under the scavenging system). This surplus provides more sizeable eggs for consumption and marketable ones with better market value than those from the local hens.

The birds of the exotic and local hen crosses had a better body weight hence a better market value than those of pure local hens. However, the exotic and local hen crosses were not different from the crosses of rustic birds as far as broodiness and raising of chicks are concerned. The gross margins for family poultry husbandry ranges from \$74-\$429 with a net margin of \$27-\$226. Family poultry is therefore profitable irrespective of whether it is the scavenging or semi-intensive system.

The net margin represents 7.3%, 3.2% and 2.2% of non-food, food and (non+) food household monthly expenditures well above those of the newly recruited participants respectively. The gross margins account for 13.1% and 5.7% of the non-food and food expenses respectively with project participants still faring better than the newly recruited participants. Furthermore, the analysis of the number of eggs (96) disposed of each year by a respondent shows that an average of 39, 39 and 18 eggs were sold, consumed or given out by an average respondent. Meanwhile, the project participants were better off as the number of fowls sold or given out were significantly ( $P < 0.05$ ) higher than those sold or given out by the newly recruited counterparts.

The performance of family poultry (chicken) husbandry and its contributions to the welfare of the rural poor in Haiti could be significantly improved upon if constraints of the sub-sector are addressed. Measure should be taken to reduce the primary constraint which happens to be bird mortality through the institution of a sustainable vaccination system, ensure farmers adopt appropriate bio-security and management practices, construction of coops that could withstand Natural disasters, regular follow-up coupled with facilitating access to inputs (vaccines, drugs, feed). Meanwhile, further research is required to identify high productive rustic hens that could be coupled with the introduced exotic birds for a better performance.

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Table 20: Haiti mission Work Plan

S/N	Activity	Weeks (starting 16 August 2010)															
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	14	16
1	Meet FAO personnel / stakeholders in Port-au-Prince	■	■														
2	Participate at the stakeholders forum organised by the ministry of Agriculture		■														
3	Agree on areas of work and focus with country representatives	■	■	■	■	■											
4	Exploit reports and secondary data in FAO (Haiti)	■															
5	Appraisal visit to family poultry farmers			●	●	●	●	●									
6	Literature Review																
7	Reformulate work plan and methodological design	■															
8	Design data collection guide, questionnaires, pilot test and improve					■											
9	Training of enumerators (3/department or 3*2 enumerators) translator(s)					■											
10	Questionnaire administration/ Visit key informants or institutions									■							
11	Focus group discussion/Consolidation of group views/visit key informants									■		■					
12	Coding of questionnaires and creation of data base											■		■			
13	Enter data in machine (two enumerator to assist)											■					
14	Check data for abnormalities and clean accordingly											■					

S/N	Activity	Weeks (starting 16 August 2010)															
15	Analysis and interpretation socioeconomic data																
16	Report findings (article and routine report)																
17	Participate in meetings that may broaden scope of work						■	■	■	■	■	■	■	■	■		
18	Communicate with country and head office					■	■	■	■	■	■	■	■	■	■	■	
19	Support to program implementation & Learning					■	■	■	■	■	■	■	■	■	■	■	
20	Visit and discuss subject matter with interested parties (eg. University, NGO, extension service ministry of livestock...)						■	■	■	■	■	■	■	■	■		
31	Restitution, finalization and Departure															■	

## Questionnaire

### Questionnaire pour l'évaluation de la composante aviculture

#### Section A: A compléter avant et après l'interview

No du questionnaire.		Date	
Temps de début :		Enquêteur	
Temps l'interview prend fin:		Superviseur	
Numéro tél.: de l'enquêté		Nom de l'enquêté	

#### Section B: À remplir avant de procéder aux autres sections

1	Département	1) Sud	0) Artibonite
2	Commune	1. Chantal 2. Torbeck 3. Arniquet 4. Petite Rivière	5. Marchand Dessalines
3	Localité		
4	Statut de l'enquêté	1) Ancien bénéficiaire du projet avicole	0) Nouveau bénéficiaire du projet avicole
5	Nombre d'année depuis l'appui du projet (en coq, formation, etc.)		
6	Quel type de Coq raceur as-tu reçu de la part du projet avicole?	1. Plymouth 2. Rhode Island Red 3. Coucalé	4. Croisement Leghorn/Rhode I. Red

#### Section C: Caractéristiques socio-économiques des enquêtés et du ménage

7	Quel est le <b>sexe</b> de l'enquêté ?		1) Féminine	0) Masculine
8	Quel est l' <b>âge</b> de l'enquêté ? (années)			
9	Quel est le <b>statut matrimoniale</b> de l'enquêté?		1. Marié 2. Célibataire	3 Divorcé 4. Veuf (-ve) 5. Séparé 6. « Placé »
10	Quel est le <b>niveau de scolarisation</b> le plus élevé de l'enquêté ?		1. Primaire 2. Secondaire	3. Université 4. Aucun
11	Quelle est la <b>taille</b> de votre ménage?			
12	Nombre d'adultes > = 18 ans ?			
13	Nombre d'enfants <18 ans?			
14	Nombre d'enfants <5 ans?			
15	Quelle sont les <b>dépenses moyennes du mois</b> passé pour la <b>restauration du m</b> (dépense nourriture/mois en gdes)			
16	Quelles sont les <b>dépenses moyennes</b> (en gde) sur les articles <b>non-alimentaires</b> le mois dernier (dons, habillement etc.) ?			
17	Combien ( <b>de gdes</b> ) avez-vous <b>épargnez</b> le mois dernier ?			
18	Quelle est la superficie de terre (ha) cultivable que vous disposez ? (y-compris la superficie autour du ménage)			
19	Quelle sont vos <b>principales sources de revenu par ordre d'importance</b>	<b>Principale source # 1</b> 1. Agriculture 2. Aviculture 3. La pêche 4. Elevage d'autre animaux 5. Petit commerce 6. Emploi 6. Artisanal 8. Autres, précisez	<b>Principale source # 1</b> 1. Agriculture 2. Aviculture 3. La pêche 4. Elevage d'autre animaux 5. Petit commerce 6. Emploi 6. Artisanal 8. Autres, précisez	<b>Principale source # 1</b> 1. Agriculture 2. Aviculture 3. La pêche 4. Elevage d'autre animaux 5. Petit commerce 6. Emploi 6. Artisanal 8. Autres, précisez
20	Quel est le <b>revenu moyen (gdes) par mois</b> provenant de l'activité principal cité ci-dessus?			

#### Section E: Efficacité technique de l'intervention

##### I. Vaccination et mortalités

21	Avez-vous <b>vacciné</b> vos oiseaux contre la <i>fièvre</i> (ND) aux cours des derniers douze mois ?	1) Oui	0) Non
22	Si oui, <b>combien des oiseaux</b> avez-vous vaccinés aux cours des derniers douze mois?		
23	<b>Si oui, Combien</b> au total (en gdes) avez-vous payé pour faire <b>vacciner</b> vos volailles?		
24	Si oui, pensez vous que vos volailles étaient protégés grâce a cette vaccination ?	1) Oui	0) Non
25	Si non, pour quelles raisons ?		
26	Combien Aviez-vous <b>dépensé</b> aux cours des derniers douze mois pour l'alimentation et médicament/vaccination des vos volailles ?		
27	Combien de <b>poulets</b> ont été perdus en <b>raison de prédateurs</b> les douze dernier mois écoulés ?		
28	Quelles caractéristiques avantageuses possèdent les volailles hybrides sur les volailles créoles?		
29	Quelles caractéristiques avantageuses possèdent les volailles créoles sur descendants des volailles hybrides?		
30	Avez-vous désinfecté votre poulailler depuis qu'il a été <b>désinfecté</b> par le projet?	1) Oui	0) Non
31	Si oui, combien de fois aux cours des derniers douze mois écoulés?		

## II. Productivités et caractéristiques des poulaillers

32	Est-ce que vous-aviez un <b>poulailler avant</b> l'appui du projet	1) Oui	0) Non
33	<b>Si non</b> , où est ce que la <b>majorité</b> des poulets passaient leurs nuitées?	1. Sur arbres 2. La Maison	3. maison/arbres 4. Autres, spécifiez .....
34	Combien avez-vous dépensez pour la construction du poulailler ? en gde		
35	Où est ce que la plus part des poulets passent la nuit maintenant?	1. Poulailler 2. Sur arbres	4. maison/arbres 3. La Maison 5. Autre, spécifiez .....
36	Quel est la dimension de votre poulailler actuel (en m²)?		
37	Le poulailler est construit avec lesquels des matériels suivants	1.Toiture en chaume, mur bambou 3.Toiture en tôle, mur cimenté(+grillage) 5)Toiture en chaume, clissage	2. Toiture en chaume, mur en planche 4.Toiture en tôle, mur en planche 6) toiture tôle clissade

Quel est l'effectif actuel des poules élevées pour chaque catégorie ci-dessous ? Adresser a tous

		Poussin	Poulette	Coquelet	Poules	Coqs
38	Descendants des coqs hybrides					
39	Effectifs volailles Creoles					
40	Effectif total					

## III. Productivité volaille Adresser à tous les interviewé

	Description	Descendants des Volailles Hybride	Descendants des Volailles Créole
41	Total d'œufs pondus / poule		
42	Nombre d'œufs couvée/poule		
43	Nombre d'œufs éclos/couvée/poule		
44	Nombre de couvée/poule/an		
45	Nombre des poussins sevrés par poule		
46	Nombre de poussins survivant après éclosion jusqu'à la maturité		

47	Les œufs des poules hybride sont ils différents des poules Créole? (question adressée aux anciens bénéficiaires)	1) Oui	0) Non
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48	Si oui, quelles différences il y a-t-il entre les œufs des poules hybride et poules Créole?	1	
49	Est ce que certains membres de la localité ont <b>croisés</b> leurs <b>poules</b> avec le <b>coq hybride</b> à votre disposition ? ( <i>anciens bénéficiaires seulement</i> ) voisins compris !	1) Oui	0) Non
50	Si oui, <b>combien</b> des <b>personnes</b> dans votre communauté ont effectivement croisés leurs poules avec le coq hybride offert par le projet?		
51	Combien de fois avez-vous été <b>visité</b> par un <b>technicien</b> (ministère, ONG. etc.) au cours de la dernière année pour un appui en aviculture?		

### Section D: Importance économique et sociale de l'aviculture familiale pour les ménages

52	Quelles sont vos <b>raisons</b> principales pour l' <b>élevage</b> des poulets?	<u>1ère raison</u> 1. Source de revenu 2. Consommation 3. Festivité 4. Culture 5) Autres, précisez	<u>2ème raison</u> 1. source de revenu 2. Consommation 3. Festivité 4. Culture 5) Autres, précisez	<u>3ème raison</u> 1. source de revenu 2. Consommation 3. Festivité 4. Culture 5) Autres, précisez
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Combien d'œufs ou poulets sont vendus, consommés ou offert comme don au cours derniers douze mois ? (remplissez le tableau ci-dessous)

		Œufs		Poulet	
		Quantité	Valeur (gdes)	Quantité	Valeur (gdes)
51	Ventes				
52	Consommés				
53	Dons				
54	Combien <b>gagnez-vous</b> pour des ventes d' <b>autres animaux chaque année</b> (en gdes)?				

### F. Alimentation

55	Offrez-vous des <b>aliments concentrés</b> à vos oiseaux ?	1) Oui	0) Non		
56	Si oui, environ quelles quantités (en kg) d'aliments concentrés étaient acheté au des derniers douze mois ?				
56	Quels sont les principaux grains (aliments local) donnés aux oiseaux par ordre d'importance? gdes	<u>Important # 1</u> 1. Mais 2. Riz 3. 4. autre, à spéc.	<u>Important # 2</u> 1. Mais 2. Riz 3. 4. autre, à spéc.	<u>Important # 3</u> 1. Mais 2. Riz 3. 4. autre, a spéc.	<u>Important # 4</u> 1. Mais 2. Riz 3. 4. autre, à spéc..
57	Combien des fois nourrissez-vous les poulets par jour en général?				

### Le défi du développement de l'aviculture familiale

58. Quels sont les facteurs limitant expansion de l'élevage des poulets dans la localité par ordre d'importance?

59. Quels conseils donnerez-vous pour améliorer de façon significative l'élevage de volaille dans votre localité ? -----

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Merci pour le temps accordé pour l'interview