



# International Journal of

Environmental & Agriculture Research

[www.ijoeear.com](http://www.ijoeear.com)

**ISSN**

2454-1850



**Volume-5, Issue-10, October 2019**

## Preface

We would like to present, with great pleasure, the inaugural volume-5, Issue-10, October 2019, of a scholarly journal, *International Journal of Environmental & Agriculture Research*. This journal is part of the AD Publications series *in the field of Environmental & Agriculture Research Development*, and is devoted to the gamut of Environmental & Agriculture issues, from theoretical aspects to application-dependent studies and the validation of emerging technologies.

This journal was envisioned and founded to represent the growing needs of Environmental & Agriculture as an emerging and increasingly vital field, now widely recognized as an integral part of scientific and technical investigations. Its mission is to become a voice of the Environmental & Agriculture community, addressing researchers and practitioners in below areas

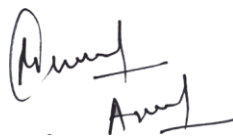
### **Environmental Research:**

*Environmental science and regulation, Ecotoxicology, Environmental health issues, Atmosphere and climate, Terrestrial ecosystems, Aquatic ecosystems, Energy and environment, Marine research, Biodiversity, Pharmaceuticals in the environment, Genetically modified organisms, Biotechnology, Risk assessment, Environment society, Agricultural engineering, Animal science, Agronomy, including plant science, theoretical production ecology, horticulture, plant, breeding, plant fertilization, soil science and all field related to Environmental Research.*

### **Agriculture Research:**

*Agriculture, Biological engineering, including genetic engineering, microbiology, Environmental impacts of agriculture, forestry, Food science, Husbandry, Irrigation and water management, Land use, Waste management and all fields related to Agriculture.*

Each article in this issue provides an example of a concrete industrial application or a case study of the presented methodology to amplify the impact of the contribution. We are very thankful to everybody within that community who supported the idea of creating a new Research with *IJOEAR*. We are certain that this issue will be followed by many others, reporting new developments in the Environment and Agriculture Research Science field. This issue would not have been possible without the great support of the Reviewer, Editorial Board members and also with our Advisory Board Members, and we would like to express our sincere thanks to all of them. We would also like to express our gratitude to the editorial staff of AD Publications, who supported us at every stage of the project. It is our hope that this fine collection of articles will be a valuable resource for *IJOEAR* readers and will stimulate further research into the vibrant area of Environmental & Agriculture Research.



Mukesh Arora  
(Editor-in Chief)



Dr. Bhagawan Bharali  
(Managing Editor)

## Fields of Interests

Agricultural Sciences	
Soil Science	Plant Science
Animal Science	Agricultural Economics
Agricultural Chemistry	Basic biology concepts
Sustainable Natural Resource Utilisation	Management of the Environment
Agricultural Management Practices	Agricultural Technology
Natural Resources	Basic Horticulture
Food System	Irrigation and water management
Crop Production	
Cereals or Basic Grains: Oats, Wheat, Barley, Rye, Triticale, Corn, Sorghum, Millet, Quinoa and Amaranth	Oilseeds: Canola, Rapeseed, Flax, Sunflowers, Corn and Hempseed
Pulse Crops: Peas (all types), field beans, faba beans, lentils, soybeans, peanuts and chickpeas.	Hay and Silage (Forage crop) Production
Vegetable crops or Olericulture: Crops utilized fresh or whole (wholefood crop, no or limited processing, i.e., fresh cut salad); (Lettuce, Cabbage, Carrots, Potatoes, Tomatoes, Herbs, etc.)	Tree Fruit crops: apples, oranges, stone fruit (i.e., peaches, plums, cherries)
Tree Nut crops: Hazlenuts. walnuts, almonds, cashews, pecans	Berry crops: strawberries, blueberries, raspberries
Sugar crops: sugarcane. sugar beets, sorghum	Potatoes varieties and production.
Livestock Production	
Animal husbandry	Ranch
Camel	Yak
Pigs	Sheep
Goats	Poultry
Bees	Dogs
Exotic species	Chicken Growth
Aquaculture	
Fish farm	Shrimp farm
Freshwater prawn farm	Integrated Multi-Trophic Aquaculture
Milk Production (Dairy)	
Dairy goat	Dairy cow
Dairy Sheep	Water Buffalo
Moose milk	Dairy product
Forest Products and Forest management	
Forestry/Silviculture	Agroforestry
Silvopasture	Christmas tree cultivation
Maple syrup	Forestry Growth
Mechanical	
General Farm Machinery	Tillage equipment
Harvesting equipment	Processing equipment
Hay & Silage/Forage equipment	Milking equipment
Hand tools & activities	Stock handling & control equipment
Agricultural buildings	Storage

<b>Agricultural Input Products</b>	
Crop Protection Chemicals	Feed supplements
Chemical based (inorganic) fertilizers	Organic fertilizers
<b>Environmental Science</b>	
Environmental science and regulation	Ecotoxicology
Environmental health issues	Atmosphere and climate
Terrestrial ecosystems	Aquatic ecosystems
Energy and environment	Marine research
Biodiversity	Pharmaceuticals in the environment
Genetically modified organisms	Biotechnology
Risk assessment	Environment society
Theoretical production ecology	horticulture
Breeding	plant fertilization

## **Board Members**

### **Mukesh Arora (Editor-in-Chief)**

BE(Electronics & Communication), M.Tech(Digital Communication), currently serving as Assistant Professor in the Department of ECE.

### **Dr. Bhagawan Bharali (Managing Editor)**

Professor & Head, Department of Crop Physiology, Faculty of Agriculture, Assam Agricultural University, Jorhat-785013 (Assam).

### **Dr. Josiah Chidiebere Okonkwo**

PhD Animal Science/ Biotech (DELSU), PGD Biotechnology (Hebrew University of Jerusalem Senior Lecturer, Department of Animal Science and Technology, Faculty of Agriculture, Nau, AWKA.

### **Dr Peni Kistijani Samsuria Mutalib**

Working as Research coordinator and HOD in the department of Medical Physics in University of Indonesia.

### **Professor Jacinta A.Opara**

Working full-time and full-ranked Professor and Director, Centre for Health and Environmental Studies at one of the top 10 leading public Universities in Nigeria, the University of Maiduguri-Nigeria founded in 1975.

### **Dr. Sunil Wimalawansa**

MD, PhD, MBA, DSc, is a former university professor, Professor of Medicine, Chief of Endocrinology, Metabolism & Nutrition, expert in endocrinology; osteoporosis and metabolic bone disease, vitamin D, and nutrition.

### **Dr. Rakesh Singh**

Professor in Department of Agricultural Economics, Institute of Agricultural Sciences, Banaras Hindu University, Also Vice President of Indian Society of Agricultural Economics, Mumbai.

### **Dr. Ajeet singh Nain**

Working as Professor in GBPUA&T, Pantnagar-263145, US Nagar, UK, India.

### **Prof. Khalil Cherifi**

Professor in Department of Biology at Faculty of Sciences, Agadir, Morocco.

### **Prof. Özhan ŞİMŞEK**

Agriculture Faculty, Department of Horticulture, Çukurova University, Adana, 01330 Turkey.

### **Dr. Anka Ozana Čavlović**

Working as Professor in the department of Faculty of Forestry, University of Zagreb, Svetošimunska 25, Zagreb.

### **Prof. Salil Kumar Tewari**

Presently working as Professor in College of Agriculture and Joint Director, Agroforestry Research Centre (AFRC) / Program Coordinator in G.B. Pant University of Agric. & Tech., Pantnagar - 263 145, Uttarakhand (INDIA).

## **Goswami Tridib Kumar**

Presently working as a Professor in IIT Kharagpur from year 2007, He Received PhD degree from IIT Kharagpur in the year of 1987.

## **Dr. Mahendra Singh Pal**

Presently working as Professor in the dept. of Agronomy in G. B. Pant University o Agriculture & Technology, Pantnagar-263145 (Uttarakhand).

## **Jiban Shrestha**

### **Scientist (Plant Breeding & Genetics)**

Presently working as Scientist (Plant Breeding and Genetics) at National Maize Research Programme (NMRP), Rampur, Chitwan under Nepal Agricultural Research Council (NARC), Singhdarbar Plaza, Kathmandu, Nepal.

## **Dr. V K Joshi**

Professor V.K.Joshi is M.Sc., Ph.D. (Microbiology) from Punjab Agricultural University, Ludhiana and Guru Nanak Dev University, Amritsar, respectively with more than 35 years experience in Fruit Fermentation Technology, Indigenous fermented foods, patulin ,biocolour ,Quality Control and Waste Utilization. Presently, heading the dept. of Food Science and Technology in University of Horticulture and Forestry, Nauni-Solan (HP), India.

## **Mr. Aklilu Bajigo Madalcho**

Working at Jigjiga University, Ethiopia, as lecturer and researcher at the College of Dry land Agriculture, department of Natural Resources Management.

## **Dr. Vijay A. Patil**

Working as Assistant Research Scientist in Main Rice Research Centre, Navsari Agricultural University, Navsari. Gujarat- 396 450 (India).

## **Dr. S. K. Jain**

Presently working as Officer Incharge of All India Coordinated Sorghum Improvement Project, S. D. Agricultural University, Deesa, Gujarat.

## **Dr. Salvinder Singh**

Presently working as Associate Professor in the Department of Agricultural Biotechnology in Assam Agricultural University, Jorhat, Assam.

Dr. Salvinder received MacKnight Foundation Fellowship for pre-doc training at WSU, USA – January 2000- March 2002 and DBT overseas Associateship for Post-Doc at WSU, USA – April, 2012 to October, 2012.

## **Mr. Anil Kumar**

Working as Junior Research Officer/Asstt. Prof. in the dept. of Food Science & Technology in Agriculture & Technology, Pantnagar.

## **Muhammad Farooq**

Mphil (Food Technology) Gold Medalist

PhD Scholar, Food Science and Biological Engineering, Jiangu University in China

Production Manager Zeal Food & Beverages Industry Aladand Road, Amandara Batkhela Malakand Agency KP. He developed the skills for Preparation of different fruit pulp preserve Orange, Peach, Guava, Strawberry, and orange squash, orange marmalade.

## **Dr. Deshmukh Amol Jagannath**

Presently working as Assistant Professor in Dept. of Plant Pathology, College of Agriculture polytechnic, NAU, Waghai.



## Table of Contents

S.No	Title	Page No.
1	<p><b>Assessing Fruit Farmers' Perceptions of Post-Harvest Losses in the Ashanti Region of Ghana</b>  <b>Authors:</b> Kofi Kyei, Kenichi Matsui</p> <p> DOI: <a href="https://dx.doi.org/10.5281/zenodo.3523841">https://dx.doi.org/10.5281/zenodo.3523841</a></p> <p> <b>Digital Identification Number:</b> IJOEAR-SEP-2019-8</p>	01-05
2	<p><b>Research progress of Chinese sucker (Myxocyprinus Asiaticus)</b>  <b>Authors:</b> Xiao-jiang Chen</p> <p> DOI: <a href="https://dx.doi.org/10.5281/zenodo.3523844">https://dx.doi.org/10.5281/zenodo.3523844</a></p> <p> <b>Digital Identification Number:</b> IJOEAR-OCT-2019-1</p>	06-09
3	<p><b>Farmers-Nomads conflict: effective local ways of conflicts resolutions over land use rights, in Greater Kordofan State, Sudan</b>  <b>Authors:</b> Salim Hamid Salim Hamid, Qijie Gao, Mohammed Abdelmanan Hassan, Khalid M. E.Elamin</p> <p> DOI: <a href="https://dx.doi.org/10.5281/zenodo.3523846">https://dx.doi.org/10.5281/zenodo.3523846</a></p> <p> <b>Digital Identification Number:</b> IJOEAR-OCT-2019-2</p>	10-17
4	<p><b>Uplifting Farmers Communities: A Training Needs Assessment</b>  <b>Authors:</b> Nerisa N. Paladan</p> <p> DOI: <a href="https://dx.doi.org/10.5281/zenodo.3524912">https://dx.doi.org/10.5281/zenodo.3524912</a></p> <p> <b>Digital Identification Number:</b> IJOEAR-OCT-2019-5</p>	18-28



# Assessing Fruit Farmers' Perceptions of Post-Harvest Losses in the Ashanti Region of Ghana

Kofi Kyei<sup>1\*</sup>, Kenichi Matsui<sup>2</sup>

<sup>1</sup>Graduate School of Life and Environmental Sciences, University of Tsukuba, Japan

<sup>2</sup>Faculty of Life and Environmental Sciences, University of Tsukuba, Japan

**Abstract**— *Post-harvest loss reduces food availability. The need to examine post-harvest loss in Africa is recognized in one of 2030 SDG goals for sustainable consumption and production. This goal appears to be a tremendous challenge as Africa expects to double its population from 1.2 billion to 2.5 billion. This paper examines fruit farmers' perceptions about post-harvest loss in the Ashanti Region of Ghana. We interviewed 70 fruit farmers about the sources of post-harvest loss. We also assessed the relationship between their perceptions and socio-demographic characteristics. In revealing nuanced perceptions, we used the five-point Likert-scale in some questions. To determine the relationship between farmers' perceptions and their socio-demographic characteristics, we conducted the multiple linear regression analysis. We found that the respondents were most concerned about their loss at market centers and storage. Loss during transportation was the least source of post-harvest loss perceived by the fruit farmers. The results from the regression analysis also showed that age, gender and farming experience were significantly associated with their perceptions. This paper then makes some recommendations to help reduce post-harvest loss for farmers.*

**Keywords**— *Post-Harvest Loss, Fruit Farmers, Market Center, Ashanti Region, Ghana.*

## I. INTRODUCTION

The past studies on post-harvest loss of fruit crops tended to focus on estimating the amount of loss occurring on farms. Reference [1], for example, estimated the amount of post-harvest loss of mango fruits in Benin. After interviewing the farmers, they found about 50% of harvest was lost at the end of the crop year. A similar study in Costa Rica found 14.1% of post-harvest loss of the same fruit during the dry season, and 84.4% during the rainy season [2]. Using the questionnaire survey, [3] in Brazil found 28% of post-harvest loss of mangoes. Another study in Pakistan found that 31% of mangoes lost in the transportation process from farm to market centers [4].

Other fruits also had estimation studies on post-harvest loss. Studies on bananas tend to suggest that long distance for transportation and poor road conditions led to more losses in Kenya [5]. In Sri Lanka, a questionnaire survey revealed that 20% of post-harvest loss of banana occurred from farms to distribution centers [6]. In Fiji, 4% to 10% of post-harvest loss of fruits in general occurred at municipal markets [7].

These studies provided some valuable information about the varying amount of post-harvest loss by types of fruits and areas, but they are remarkably silent about the main causes of post-harvest loss. Considering this research gap, this paper attempts to identify the main sources of post-harvest loss. In particular, it examines fruit farmers' perceptions about the sources of post-harvest loss in the Ashanti Region of Ghana. It also assesses the correlation between farmers' perceptions and their socio-demographic characteristics to determine the factors that influence their perceptions.

## II. METHODOLOGY

### 2.1 Data Collection and Analysis

Considering the importance of fruit production for Ghana and western Africa, we selected Sekyere-Kumawu District of the Ashanti Region. With a population of about 65,402 people, it is one of the most productive agricultural districts in the Region. Over 81.8% of households in this district are engaged in agriculture. The most prominent fruits grown here include orange, banana, avocado, pear, guava, pawpaw, pineapple and mango [8].

Before conducting the survey, we conducted field observation to better design the questionnaire. We selected a total of 70 fruit farmers by purposive sampling in five communities (Abotanso, Besoro, Domeabra, Woraso and Banko) in the district for in-person interviews. The farmers selected were engaged in orange, banana, avocado and mango production. The survey was administered in March 2019 with approval and support from two national service personnel at Sekyere- Kumawu District of Agriculture.

The questionnaire had two-sections. The first section focused on fruit farmers socio-demographic characteristics. The second section attempted to clarify farmers' perceptions about sources of post-harvest loss. We evaluated the perceptions by using five-point Likert-scale. We then applied the multiple linear regression analysis to assess the relation between fruit farmers' perceptions and their socio-demographic characteristics, such as age, gender, education, farming experience and household size.

### III. RESULTS AND DISCUSSION

#### 3.1 Socio-Demographic Characteristics of Fruit Farmers

The result of farmer's socio-demographic characteristics shows that the average age of the respondents was approximately 50years old with average farming experience of 15 years (Table 1).The minimum and maximum age was 25 years and 66 years old, respectively. This indicates a trend of aging population among fruit farmers in the region. Most farmers had completed senior high school education. The average household size was eight persons. These are smallholder farmers as they had less than two acres of farmland.

**TABLE 1**  
**SOCIO-DEMOGRAPHIC CHARACTERISTICS OF THE RESPONDENTS**

Variables	Mean	Standard Deviation	Minimum	Maximum
Age	49.68	14.33	25	66
Gender 0=Female 1=Male	0.78	0.42	0	1
Years of Education (Cumulative)	9.7	4.63	0	15
Experience (Year)	15	6.55	5	32
Household Size	7.93	3.34	2	12
Land Size (Acre)	1.3	0.56	1	3

#### 3.2 Farmers' Perceptions about Sources of Post-Harvest Loss

The second section of our questionnaire survey aimed to understand farmers' perceptions about sources of post-harvest loss. As past studies showed different amounts of loss by types of fruits, we first looked at orange harvest (Table 2).The results show that the respondents perceived loss at market centers as the most serious problem. At markets, these farmers experienced rejection from market traders because of the shape and size of their orange products. Loss by pest infestation, such as fruit flies, was the second highest concerns. Interestingly, the respondents perceived loss during transportation as the least serious problem. They said that they normally make transportation arrangements to market centers a day or two in advance before harvesting their products. These arrangements help drivers to do a proper maintenance of their vehicles before coming to the production centers.

The result about banana harvest appears somewhat different from that of orange harvest. The respondents perceived loss at storage as the most serious problem (Table 3). Farmers in this area normally keep harvested bananas in storage bags before sending them to various market centers. They store both matured and unmaturred bananas together in these bags. This mixing tends to ripen the bananas faster. The second highest concern was loss at market centers. Bananas are exposed to direct sunlight at market centers. The prolonged exposure to direct sunlight causes the bananas to ripen faster.

For mango harvest, loss occurring at market centers was the most serious problem (Table 4). The respondents explained that this loss was most concerning as mangoes tend to be rotten relatively quickly after harvest. Mangoes are also fragile to damages caused by the weight of other fruits during the transportation. Loss at storage was the second highest concern. Many of the harvested mangoes are often left rotten because of lack of refrigeration at market centers. Harvested mangoes are normally placed in bags that tend to speed up the ripening process. Farmers we interviewed did not pay much attention to the kind of bags they used in storing mangoes. Surprisingly, however, loss during transportation was perceived as the least concern by farmers. This result does not correspond with the study by [4] who found that 31% of mangoes were lost due to transportation from farm to the market centers.

The result about avocado harvest is similar to that of orange and mango harvests, as loss at market centers was the most

serious issue (Table 5). The respondents said that lack of a sustained ready market to sell their products led to the loss. The loss at storage was the second highest concern. The respondents said that they stored their harvest on their farms or homes. Losses occurred when market traders failed to come to their farms to buy. When this happened, the respondents buried the harvested fruit crops in the soil.

**TABLE 2**  
**DESCRIPTIVE STATISTICS OF SOURCES OF LOSS (ORANGE HARVEST)**

Sources of Loss	Mean	Standard Deviation	Minimum	Maximum
Loss during Harvest	2.65	1.16	1	5
Loss by Pest Infestation	3.54	1.21	1	5
Loss at Storage	3.18	0.91	2	5
Loss during Transportation	1.15	0.82	1	5
Loss at Market Center	4.04	1.12	2	5

**TABLE 3**  
**DESCRIPTIVE STATISTICS OF SOURCES OF LOSS (BANANA HARVEST)**

Sources of Loss	Mean	Standard Deviation	Minimum	Maximum
Loss during Harvest	2.15	0.96	1	5
Loss by Pest Infestation	3.33	1.19	2	5
Loss at Storage	4.31	1.11	1	5
Loss during Transportation	1.66	0.93	1	5
Loss at Market Center	3.58	0.89	2	5

**TABLE 4**  
**DESCRIPTIVE STATISTICS OF SOURCES OF LOSS (MANGO HARVEST)**

Sources of Loss	Mean	Standard Deviation	Minimum	Maximum
Loss during Harvest	2.36	1.00	1	5
Loss by Pest Infestation	3.05	1.31	2	5
Loss at Storage	3.59	0.86	1	5
Loss during Transportation	1.65	0.94	1	5
Loss at Market Center	4.35	1.09	2	5

**TABLE 5**  
**DESCRIPTIVE STATISTICS OF SOURCES OF LOSS (AVOCADO HARVEST)**

Sources of Loss	Mean	Standard Deviation	Minimum	Maximum
Loss during Harvest	2.36	1.00	2	5
Loss by Pest Infestation	3.14	1.37	1	5
Loss at Storage	3.71	0.91	1	5
Loss during Transportation	1.65	0.94	1	5
Loss at Market Center	4.14	1.14	1	5

### 3.3 Correlation between Perceptions and Socio-Demographic Characteristics

After finding the above results, we attempted to establish the correlation between farmers' perceptions and their socio-demographic characteristics (Table 6) by using excel. Here, perception results on the four fruits were aggregated together mainly because we did not find substantial differences in respondents' perceptions by fruits. So, we grouped farmers' perceptions about loss during harvest for all fruits as dependent variables. The same approach was made for pest infestation, storage, transportation and market centers.

The result indicates that age was significantly associated with loss during harvest and transportation. This implies that older farmers in Sekyere-Kumawu District regarded loss during harvest ( $p$ -value  $< 0.05$ ) and loss during transportation ( $p$ -value  $< 0.05$ ) more seriously than younger farmers did. This result is consistent with a 2018 study by the University of Illinois College of Agricultural, Consumer and Environmental Science [9].

Although years of farming experience had significant association with storage loss ( $p$ -value  $< 0.05$ ), it did not seem to have any significant association with loss during transportation ( $p$ -value  $> 0.05$ ). Experienced farmers tend to make transportation arrangements to market centers in advance before harvesting. However, they tended to care less about types of bags to be used for storage. This led to the loss during the storage period.

As past studies emphasized the importance of women's roles in rural food security, we attempted to find out how the gender affected post-harvest loss perceptions. Our finding confirms [10] that gender had no significant association with their perceptions.

**TABLE 6**  
**RESULTS OF FARMERS PERCEPTION AND THEIR SOCIO-DEMOGRAPHIC CHARACTERISTICS**

Variable	Loss During Harvest	Loss by Pest Infestation	Loss at Storage	Loss During Transport	Loss at Market center
Age	0.03*	0.28	0.65	0.00*	0.76
t-stat	2.21	1.10	0.45	-4.36	0.30
Gender	0.21	0.92	0.57	0.04*	0.64
t-stat	1.27	0.10	-0.58	-2.03	0.47
Education	0.33	0.53	0.24	0.10	0.72
t-stat	-0.97	-0.64	-1.20	1.68	0.36
Years of Experience	0.06	0.81	0.01*	0.76	0.41
t-stat	1.91	-0.24	-2.52	0.30	-0.84
Household Size	0.38	0.45	0.19	0.58	0.70
t-stat	-0.89	0.76	1.33	-0.56	0.38
Land size	0.89	0.57	0.70	0.18	0.75
t-stat	0.14	0.57	-0.39	-1.37	0.32
Adjusted R Square	0.09	-0.01	0.19	0.32	-0.05

\* $P$ -value  $< 0.05$

#### IV. CONCLUSION

This study examined the sources of post-harvest loss as perceived by fruit farmers in the Ashanti Region of Ghana. Our findings revealed that, overall, the respondent's perceived loss at market centers as the most serious issues. They also emphasized loss at storage and pest infestations. Contrary to some of past studies, loss during transportation was not urgent concern for the respondents as they could make a previous arrangement for transportation to minimize loss. However, the respondents appeared to have neglected to care about types of bags or containers that may help store harvested fruits for a longer period of time. From the regression analysis, we found that age and experience had significant correlations with respondents' perceptions about post-harvest loss. Interestingly, gender, educational level, land size and household size had no significant correlations with the perceptions of loss.

Considering these results, we recommend that the Ghana government or market associations install refrigeration facilities at markets to help preserve fruit crops. Extension officers at the Ministry of Food and Agriculture need to educate farmers about the type of bags or containers suitable for storing harvested fruit crops. Also, market traders may start marketing seasonal crops such as mangoes to consumers before it gets to the market centers.

#### ACKNOWLEDGEMENTS

We are grateful to all the farmers at the Sekyere-Kumawu district in the Ashanti Region of Ghana who agreed to take part in this research. We express our gratitude to the reviewers for their suggestions and comments that helped improved this research.

## REFERENCES

- [1] J. Vayssieres, S. Korie, O. Coulibaly, L. Temple, and S.P. Boueyi, "The Mango Tree in Central and Northern Benin: Cultivar Inventory, Yield Assessment, Infested Stages and Loss due to Fruit Flies (dipterataphritidae)," *Fruits*, vol. 63, pp. 335–348, 2008.
- [2] L.F. Arauz, A. Wang, J.A. Duran, and M. Monterrey, "Causas de pérdidas poscosecha de mango a nivel mayorista en Costa Rica (Factors causing postharvest losses of mango fruit at central distribution market in Costa Rica)," *Agronomia Costarricense*, vol. 18, pp. 47–51, 1994.
- [3] M.M. Choudhury and T.S. da Costa, "Perdas na cadeia de comercialização da manga (Losses in the commercialization network of mango)," *Documentos-da-Embrapa-Semi-Arido*, vol. 186, 41 pp, 2004.
- [4] K. Mushtaq, M.S. Javed, and A. Bari, "Postharvest Losses in Mango: The Case of Pakistani Punjab," *Proceedings of the International Conference on Postharvest Technology and Quality Management in Arid Tropics, Sultanate of Oman, 31<sup>st</sup> January-2<sup>nd</sup> February 2005*; pp 89–94, 2005.
- [5] J. B. George and B.M. Mwangangi, "Some Factors Affecting Banana Storage and Ripening: A Case Study of Banana Handling and Ripening in Kenya," *Acta-Hort.*, vol. 368, pp. 628–633, 1994.
- [6] W. M. C. B. Wasala, "Postharvest Losses, Current Issues and Demand for Postharvest Technologies for Loss Management in the Main Banana Supply Chains in Sri Lanka," *Journal of Postharvest Technology*, vol. 2, pp. 80–87, 2014.
- [7] S. J. Underhill and S. Kumar, "Quantifying horticulture postharvest wastage in three municipal fruit and vegetable markets in Fiji," *International Journal of Postharvest Technology and Innovation*, vol 4, pp. 251–261, 2014.
- [8] Ghana Statistical Services, "Housing and Population Census: District Analytical Report," Sekyere-Kumawu, Ashanti Region. Accessed on July 1, 2019 from: [http://www.statsghana.gov.gh/docfiles/2010\\_District\\_Report/Ashanti/SEKYERE\\_KUMAWU.pdf](http://www.statsghana.gov.gh/docfiles/2010_District_Report/Ashanti/SEKYERE_KUMAWU.pdf), 2010.
- [9] University of Illinois College of Agricultural, Consumer and Environmental Sciences, "Why are young adults wasting so much food? Study looks at perceptions and food behaviors," *ScienceDaily*, August 22, 2018. Accessed on August 2019 from [www.sciencedaily.com/releases/2018/08/180822122832.htm](http://www.sciencedaily.com/releases/2018/08/180822122832.htm), 2018.
- [10] S. K. Leite, G. S. Vendruscolo, A. A. Renk, and C. Kissmann, "Perception of Farmers on Landscape Change in Southern Brazil: Divergences and convergences related to gender and age," *Journal of Rural Studies*, vol. 69, pp. 11–18, 2019.

# Research progress of Chinese sucker (*Myxocyprinus Asiaticus*)

Xiao-jiang Chen

Jiangsu Agri-animal Husbandry Vocational College, Taizhou, Jiangsu, China

**Abstract**— In order to help readers, understand the current research situation of *Myxocyprinus Asiaticus* in China, the author collated the research on the resource status, reproductive development, artificial breeding, nutrition research and disease of the *Myxocyprinus Asiaticus*. In the future, we should increase the number of populations, strengthen the protection of wild resources, research on artificial breeding, popularization of breeding technology and genetic research.

**Keywords**— *Chinese sucker, Myxocyprinus Asiaticus, Resources distribution.*

## I. INTRODUCTION

*Myxocyprinus Asiaticus* belongs to Osteichthyes, Catostomidae and *Myxocyprinus Asiaticus* genus. *Myxocyprinus Asiaticus* is an important economic fish with high economic value, edible value and ornamental value. The content of crude protein is high, the content of crude fat is moderate, and the content of calcium, phosphorus and iron is rich. The fish meat contains eight necessary amino acids that people need, accounting for 37.16% of the total amino acids; it contains two semi-necessary amino acids that people need, accounting for 8.38% of the total amino acids. Its content of amino acids related to taste accounted for 35.54%, so its meat was delicious. Due to the longer sexual maturity of the *Myxocyprinus Asiaticus*, the survival rate in the wild is low and the population is scarce. At present, China encourages the cultivation and release of the *Myxocyprinus Asiaticus*. Therefore, deepening people's understanding of *Myxocyprinus Asiaticus* is of great significance to the protection of *Myxocyprinus Asiaticus* resources, the utilization of economic value and the improvement of breeding level.

## II. CURRENT SITUATION OF MYXOCYPRINUS ASIATICUS

*Myxocyprinus Asiaticus* is delicious, nutritious and has high ornamental value. It is a valuable economic fish. *Myxocyprinus Asiaticus* are mostly found in eastern Asia and western North America. Most of the *Myxocyprinus Asiaticus* are distributed in the upper and middle reaches of the Yangtze River. At the same time, there are a very small number of distributed in the Minjiang river<sup>[1]</sup>. Due to a series of reasons, such as overfishing, serious damage to the living environment and a long reproductive cycle, the total resources of the *Myxocyprinus Asiaticus* have been decreasing. It has been listed as the second-class aquatic wild animal in China. At present, the *Myxocyprinus Asiaticus* is one of the eight vulnerable species and is listed in the book "China endangered species red book: fish" published in 1998<sup>[2]</sup>.

## III. STUDIES ON THE REPRODUCTIVE DEVELOPMENT AND ARTIFICIAL CULTURE OF MYXOCYPRINUS ASIATICUS

Because the breeding rate of *Myxocyprinus Asiaticus* in natural state is low and the total resources are declining, it is particularly important to breed *Myxocyprinus Asiaticus* artificially.

### 3.1 Sexual maturity time and breeding conditions of *Myxocyprinus Asiaticus*

The development and maturation time of *Myxocyprinus Asiaticus* was relatively late. The sexual maturation time of wild males was more than 5 years, and that of females was more than 6 years<sup>[3]</sup>. *Myxocyprinus Asiaticus* breed from early March to late April each year. The fertilized eggs of *Myxocyprinus Asiaticus* have many characteristics, such as weak stickiness, higher density than water, the stickiness disappears soon after fertilization and most of the eggs are laid in the early morning of sunny day<sup>[4]</sup>. It is necessary to hatch it with slow-flowing water to make the egg grains unable to accumulate, which will increase the hatching rate. The dissolved oxygen in water should be above 5 mg/L, and the best water temperature should be kept between 18°C<sup>®</sup> and 20°C to hatch the membrane need 7-8 day and night. it takes 120 hours to hatch the membrane in 19°C ~24°C water temperature<sup>[5]</sup>.

### 3.2 Artificial culture of *Myxocyprinus Asiaticus* parent fish

The quality of oocyte development depends on the development of parent fish, and then affects the spawning rate, fertilization rate and hatching rate of *Myxocyprinus Asiaticus*. When choosing parent fish, we should choose those with strong body, normal surface mucus and no obvious scars on body; body weight should be over 8 kg; male fish should be over 5 years old, female fish should be over 6 years old; the secondary accessory-sexual characteristic is obvious, and male fish is

full of stars with milky white semen flowing out when abdomen is lightly pressed. Female fish should have a fuller abdomen and many stars on the buttocks and tails. Autumn was a very critical period for the gonad development of parent fish. In autumn, the transparency of the pond should be kept within 20 cm to 30 cm, and we can't stop feeding bait, and the feeding should be reduced with the decrease of water temperature. In spring, the parent fish should open mouth as early as possible, and when the water temperature rises to more than 10 °C, the pond water should be controlled at about 0.8 m to 1m to increase the water temperature, and flush regularly in autumn and winter<sup>[6]</sup>. The influence of culture density and water temperature on the growth of *Myxocyprinus Asiaticus* was very great. It was concluded that the culture density should not exceed 40 /m. It should be kept at the optimum density of 30/m to 40/m. The water temperature should not exceed 32 °C, and the optimum breeding temperature should be kept at 24 °C<sup>[7]</sup>.

#### IV. PREVENTION AND TREATMENT OF COMMON DISEASES OF MYXOCYPRINUS ASIATICUS

Diseases of *Myxocyprinus Asiaticus* in the process of artificial cultivation not only bring great losses to the cultivation of cochineal fish, but also have a great impact on the healthy development of the aquaculture industry.

According to Tian's research<sup>[8]</sup>, we can find that the main diseases of *Myxocyprinus Asiaticus* and prevention methods are as follows:

##### 4.1 Gili-rot disease:

The clinical symptoms are retardation of movement, poor appetite, discoloration and whitening of gill filaments, and even the end becomes putrid and mucus increases.

**Treatment methods:** The rotten gills are mostly caused by poor water quality and high breeding density. Chlorine dioxide (8%) can be sprinkled on the pond to disinfect it for 10 minutes, once a day for 3 to 5 days.

##### 4.2 Printing disease

The clinical manifestations are as follows: the tail of diseased fish showed spots like red seals, scales falling off, muscle decay, skin congestion and inflammation.

**Treatment methods:** Use povidone iodine (1%) 10-20 mg/L to disinfect once a day for one to two hours. Use it for three to five days.

##### 4.3 Red skin disease

The clinical symptoms are as follows: large scale exfoliation, epidermal inflammation, mucus increase, fin congestion and even decay.

**Treatment methods:** Sprinkle the whole pool with chlorine dioxide (8%) for 10 minutes once a day for three to five days.

##### 4.4 Ichthyophthiriasis

Also known as white spot disease, the clinical feature is that the fish body is covered with white spots and the surface looks like being covered with a layer of white membrane.

**Treatment methods:** Use methylene blue to disinfect the water, and make the concentration of methylene blue in the water 3-5 mg/L. After disinfection for 2 hours, fresh water is added again, once a day for three to five days.

##### 4.5 Dactylogyriasis

The clinical symptoms are not obvious. If we open the gill cap, we can see that the gill filaments are swollen and dark red.

**Treatment methods:** Oral administration of levofloxacin bait (30 mg/kg body weight) and use methylene blue to soak, to make the concentration in the pond about 5.0mg/L. After 12 hours of immersion, dilute it, once every other day and continuous use for 3 times.

##### 4.6 Japanese arguliosis disease

The clinical symptoms are the presence of arguliosis parasites in many parts of the body.

**Treatment methods:** Use 90% crystal dipterex to disinfect the pond, make the concentration of dipterex in the water 0.3-0.5mg/L. After soaking for 1-2 hours, the water was infused again, once every other day, for two to three days.



#### 4.7 Neospora

The clinical features are: gill filaments were enlarged, mucus increased, and there were many white cysts on the gill filaments.

Treatment methods: use 90% crystal dipterex to disinfect the whole pond, make the concentration of dipterex in the water 0.3-0.5mg/L. After soaking for 1-2 hours, the water was infused again, once every other day, for three to five days.

### V. STUDY ON NUTRITIONAL ASPECTS OF MYXOCYPRINUS ASIATICUS

Only relying on natural food cannot meet the needs of *Myxocyprinus Asiaticus* farming. Therefore, it is particularly important to synthesize artificial bait, which is suitable for *Myxocyprinus Asiaticus*. The feed is the first guarantee for high and stable production in fish culture, so it is also very beneficial for the growth and development of fish to prepare appropriate feed. By studying the nutritional aspects of *Myxocyprinus Asiaticus*, we can find out the most suitable feed formula for *Myxocyprinus Asiaticus*.

#### 5.1 Feeding characteristics and necessary nutrients of *Myxocyprinus Asiaticus*

The *Myxocyprinus Asiaticus* is an omnivorous fish. In natural environment, it mainly eats benthic invertebrates, such as dragonfly larvae and aquatic insects. At the same time, it also feeds on aquatic plant debris and algae. Han [9] explored the effects of feed fat and protein levels on the growth of *Myxocyprinus Asiaticus*, a series of experiments were carried out to compare and conclude that the optimum fat level is 6% - 8%, and the optimum protein level is 40%.

Ye<sup>[10]</sup> studied the effects of different feeds on the growth of *Myxocyprinus Asiaticus*. He selected four groups of feeds: feed, water earthworms, artemia, mix of feed and water. Under the same and suitable conditions, the results showed that the specific growth rate of the mixed group was the highest, followed by the water earthworm group, the feed group and the artemia group. When the proportion of feed in the mixed group was 50%~60%, the growth and development of fry was the best. Adding water worms can make up for the lack of nutrients in the feed, and this enables *Myxocyprinus Asiaticus* to absorb more comprehensive nutrients and better use them for growth, reproduction and development.

Zhang<sup>[11]</sup> considered that vitamin E was very important for the growth and development of *Myxocyprinus Asiaticus* fry. Increasing the intake of vitamin E can improve the muscle quality of *Myxocyprinus Asiaticus* appropriately. The growth performance of *Myxocyprinus Asiaticus* fry can be improved by adding vitamin E in the feed, but it will be inhibited if it is excessive. When the content of vitamin E in the feed is 50.6mg/kg, *Myxocyprinus Asiaticus* fry will get the best growth performance.

#### 5.2 Choice of larva feed for *Myxocyprinus Asiaticus*

Xu<sup>[12]</sup> selected different kinds of feed: rotifer add artemia group and aquatic-seedling formula feed group to feed healthy *Myxocyprinus Asiaticus* fry. By comparison, the effects of the two feeds on the growth rate of *Myxocyprinus Asiaticus* fry were basically the same, but the effects on the survival rate of *Myxocyprinus Asiaticus* fry were quite different. The average survival rate of *Myxocyprinus Asiaticus* fry fed rotifer and artemia reached 84.0%, while that of *Myxocyprinus Asiaticus* fry fed with aquatic-seedling formula feed was only 80.0%. It can be concluded that the living-body feed is a better choice for larva feed of *Myxocyprinus Asiaticus* fry.

#### 5.3 Study on the transferred-feeding culture of *Myxocyprinus Asiaticus*

Yi<sup>[13]</sup> studied the transferred-feeding cultivation of *Myxocyprinus Asiaticus*. The experiment was conducted at the same water temperature (24±0.5) °C. Use fairy shrimp, water worms, micro-pellet feed and spirulina as the larva feed. After comparison, it is very feasible to feed artificial feed as early as possible. The earlier the *Myxocyprinus Asiaticus* fry eats artificial diet, the easier it is to change its diet. According to the comprehensive survival rate, growth and digestive physiological indexes, it was a feasible strategy to co-feed *M. asiaticus* larvae with 3 diets (fairy shrimp, feed and spirulina) and wean on 40 dph.

### VI. SUMMARY AND PROSPECT

*Myxocyprinus Asiaticus* has very high economic value, ornamental value and edible value. However, due to the environment destruction by human beings and the low reproductive rate, the number of them has been very scarce. In the future, our main research direction should be how to improve the number and survival range of this species so as to increase the number of its population; how to effectively protect *Myxocyprinus Asiaticus* and how to strengthen the breeding and release of

*Myxocyprinus Asiaticus*; focusing on the promotion of aquaculture technology and popularization of related aquaculture knowledge; put forward a series of measures to encourage artificial cultivation of *Myxocyprinus Asiaticus* and strengthen the in-depth study on the biology and genetics of *Myxocyprinus Asiaticus*, so as to enlarge the depth and breadth of people's understanding about *Myxocyprinus Asiaticus*.

#### ACKNOWLEDGMENT

This research was financially supported by "Qing Lan Project of Jiangsu Province". This work was supported by "311 Talents Project in Taizhou" and Jiangsu Agri-animal Husbandry Vocational College (Grant No.NSFPT201739).

#### REFERENCES

- [1] Shi Dengyong, the Asian Mermaid—*Myxocyprinus Asiaticus* [J]. Beijing aquaculture,2006(03):13-17.
- [2] Zhang Feng, Li Ping. Past life and present Life of *Myxocyprinus Asiaticus* [J]. Biology Teaching,2012,37(03):55.
- [3] Deng Zhongqun, Yu Zhitang, Zhao Yan, et al. Evaluation of the impact of the Three Gorges Project on the Yangtze River white gill and *Myxocyprinus Asiaticus* and Research on Resource Protection. A collection of papers on the impact of the Yangtze River Three Gorges Project on the environment and its countermeasures. Beijing: Science Publishing,1987:42-52
- [4] Wu Tujin. Artificial domestication and breeding of *Myxocyprinus Asiaticus* [J]. Marine and fishery,2016(03):62-63.
- [5] Zhang Chongying. Artificial breeding techniques of *Myxocyprinus Asiaticus* [J]. Guidelines for Fisheries Wealth,2018(13):38-39.
- [6] Ye Jiansheng, Zhao Suzhen, Xu Baowei, et al. Effects of different stocking density and water temperature on the growth of *Myxocyprinus Asiaticus* ([J]). Jiangsu Agricultural Science, 2019,47(01):152-155.
- [7] Li Hua, Deng Xiaochuan, Guo jing. A preliminary study on the cultivation techniques of *Myxocyprinus Asiaticus* parent fish[J]. China Fisheries, 2011(02):48-49.
- [8] Tian tian. Clinical diagnosis and treatment of major diseases of *Myxocyprinus Asiaticus* [J]. Aquatic scientific and technological information, 2018,45(01):42-44.
- [9] Han Guangming, Zhang Jiahong, Kou Xiangming, et al. Effects of feed protein and fat levels on growth performance and body composition of *Myxocyprinus Asiaticus*[J]. Journal of animal nutrition,2015,27(11):3587-3596.
- [10] Ye J.S. Research progress on artificial breeding technology of *Myxocyprinus Asiaticus* [J]. Heilongjiang animal husbandry and veterinary medicine,2018(13):56-59.
- [11] Zhang Zhiqiang, Jiang Ming, Wen Hua, et al. Study on the requirement of vitamin E in feeds of *Myxocyprinus Asiaticus* fry[J]. Journal of Northwest A&F University (Natural science version),2017,45(02):23-30+36.
- [12] Xu Jinchuan, Zhu Zhihong. Effects of different feeds on the growth of *Myxocyprinus Asiaticus* fry [J]. Guidelines for Fisheries Wealth,2016(17):53-55.
- [13] Yi Jianhua, Guo Zhongdi, Liu Benxiang, et al. Effects of transferred feeding and combined feeding on the growth and digestive capacity of *Myxocyprinus Asiaticus* juvenile fish [J]. Journal of Fisheries,2016,40(02):225-235.

# Farmers-Nomads conflict: effective local ways of conflicts resolutions over land use rights, in Greater Kordofan State, Sudan

Salim Hamid Salim Hamid<sup>1</sup>, Qijie Gao<sup>2</sup>, Mohammed Abdelmanan Hassan<sup>3</sup>,  
Khalid M. E.Elamin<sup>4</sup>

<sup>1</sup>College of Humanities and Development Studies, China Agricultural University, Beijing, China.

<sup>1,2</sup>Ministry of Agriculture, Animals wealth and Irrigation, Khartoum, Sudan.

<sup>3</sup>Faculty of Forestry Sciences, University of Zalingei, Sudan.

<sup>4</sup>Beijing Forestry University- School of Economics and management, Beijing.

**Abstract**— This study was carried out in Greater Kordofan, Sudan, to explore the effective local ways of conflict resolutions and reconciliations over land use rights between farmers and nomads. The primary data were collected from five villages namely; Umdam, Tongaro, Habila, Dallang, and Abu Kirais through detailed field surveys using a questionnaire, interviews and group discussion. Cases as another means of data collection were also used to collect information from local institutions and groups of farmers and nomads. The results showed that 59.3% of the respondents (farmers and nomads) believed that the main causes of conflict were crops damaged by livestock. The study also found that farmers with a high percentage of 80.9% preferred the solutions made by a traditional council system in their communities. However, this study provides a concrete base of information regarding conflict resolutions that might help both local leaders and governments to understand the complexity of the issue in Great Kordofan.

**Keywords**— *Farmers, Nomads, Kordofan, Conflict, Resolutions.*

## I. INTRODUCTION

In human history, conflict was deep-rooted in societies at various parts of the globe. In several studies, the conflict has been described as a complex and complicated phenomenon that needs to be understood at different levels (Jerke, 2008). According to Arezki, et al(2015). Conflicts defined as natural phenomenon which considered the competition between people or groups with different interests, thoughts, beliefs, values, and goals.

Sudan is the largest third country in Africa with an area of approximately 1,861,484 sq.km (Nimir & Elzein, 2015). Sudan has longest civil war in Africa since independence in 1956. It was exposed to severe civil war in different parts, especially at south Sudan, Darfur, South Kordofan, and the Blue Niles States which led to the referendum of South Sudan in July 2011.

Conflict over natural resources is a common phenomenon in Africa and particularly in Sudan due to different ethnic groups and religions (Reuveny, et al, 2011). Agriculture is considered a backbone of Sudan's economy. More than 80% of the population in Sudan living in rural areas (Briceño-Garmendia, et al, 2009). Therefore, almost all the population is engaged in agriculture and grazing as the main source of income. Greater Kordofan is one of the most producing areas of different agricultural crops and livestock (FAO, 2019). While during the past few decades, Greater Kordofan has witnessed dramatic changes in natural resources such as vegetation cover, agriculture, and rangeland. This change is due to a prolonged and repeated period of droughts, desert encroachment and on-going war in South Kordofan (Munzoul, 2006). All these factors together have created a suitable environment for conflict between the farmers and nomads over land use rights in Greater Kordofan.

However, this conflict has threatened the lives of all people who settled the area. Regardless of the on-going conflict between farmers and nomads still the society has the potentiality of coexistence through their traditional approaches of reconciliations. The traditional leaders of these communities have an undeniable role in solving such type of conflict. Moreover, local governments also play an indispensable role in this conflict between farmers and nomads by delineating nomad's routes. In this paper, an attempt has been made to investigate the local or traditional approaches of conflict resolutions and reconciliations between farmers and nomads in Greater Kordofan.

## II. LITERATURE REVIEW

### 2.1. Customary land tenure systems and land use rights of ordinary people in Sudan

In Sudan like the elsewhere African continent, the majority of the rural population especially farmers and nomads mainly depend on land and natural resources in securing their livelihoods (Nkonya, et al, 2016). The issue of land tenure does not give attention that deserves and so far there is no proper action has been taken at least by Sudanese government to address the issue (Dlamini, 2015). In nomadic communities, the communal right has become so well embedded in their culture and daily life (Shanmugaratnam N, 2008). Change communal land ownerships in Sudan goes back to the colonial era when hungry colonizers circumvent land rules so as to extract and grabbed the natural resources with low cost for their own benefit (Abdalla & Elhadary, 2010). Several land acts have been introduced such as acts of 1925 and 1930. The overall objective is to dismantle customary land tenure systems based on common property and to provide the state full power to control and owned lands (Babiker, 2008). Sudan is one of the African countries which have witnessed the system of communal right since a long time. This system offers the tribal leaders power to manage and distribute the land fairly overall member of their community (Abdalla, & Samat, 2012). Generally, the system consists of three administrative tiers these are *Nazir* who is in charge of the entire tribal administrative and judicial affairs, *Omdas* those who supporting by *Nazir* and took the responsibility of tribal subsections and *Sheikh* who are the village head man. All these tribal leaders work in harmony to maintain security and order in their villages. In addition to that, they play a vital role in settling disputes and conflicts between their followers and outsiders (YA, 2007). This system is based mainly on having a historic right to land which is accessed either through fighting with neighbors or in few cases granted as a gift by (*Sultan*) king of the State. This land is known locally as *Dar* in eastern states of Sudan or *Hakura* as in Darfur (means a homeland), which has been defined by customary or communal rights. Within the *Dareach* member or group would maintain primary rights of access to use the land for farming and grazing within the territory under the system (Komey , 2009).

### 2.2. Land use rights and conflict resolution between farmers and nomads

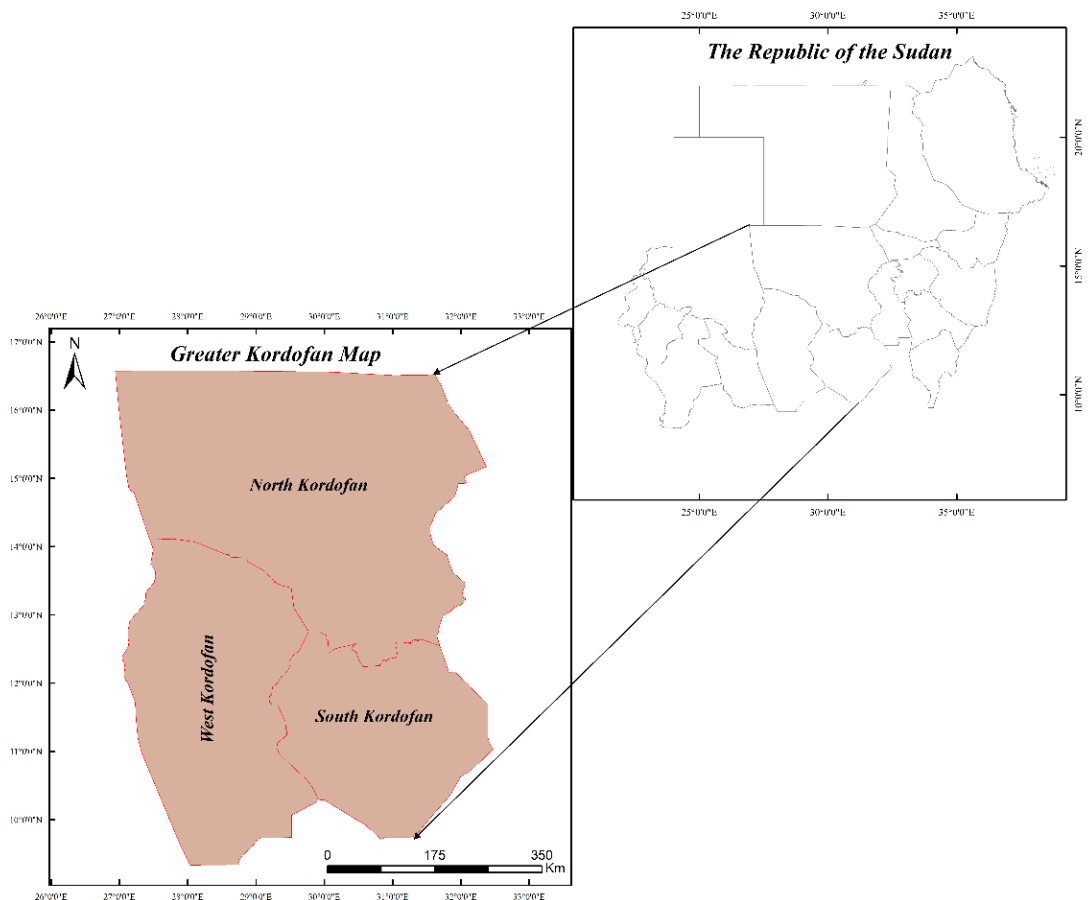
In Nigeria, according to Ofuku (2007) who suggested that local development plans and strategies should be established and directed to reduce conflicts between farmers and nomads. Further, he reported that the extent of damage and compensation should be agreed upon by both farmers and nomads at the community level with agricultural extension agents as facilitators (Ofuoku & and Isife, 2009). In Yakurr Region of Cross River State, there is an urgent need for grazing cattle to access rangeland resources across the regions in order to ensure food security for livestock. In view of this, the study recommends that nomadic education and the mechanism tagged local development plans be adopted by extension agencies to reduce conflict in rural areas where grazing of cattle is inevitable (Osagie, et al, 2010). Conflict over land use can be expected to increase in Mali as populations expand and rainfall and temperatures become more erratic. However, while measures that slow the pace of these changes are important, In some cases, formalizing agreements and having those backed by trusted customary or government authorities may engender greater commitment and respect for the established rules (Olateju, 2010). Generally, the use of conflict in plural legal systems was prompted by current land and water reforms that are underway in most African countries. These reforms focus on the use of statutory legal systems to regulate the use of land and water resources. However, all of these countries have a pluralistic legal system-land and water resources are regulated by different pieces of legislations and institutions, including statutory law, customary laws of different ethnic groups as well as Islamic law (Roy, 2005). The diverse customary norms and laws are often more important than statutory law and are relied upon in resolving natural resource management conflicts. In these countries, statutory laws regulate very few human activities. However, neglect of customary laws may have negative consequences for individuals and groups who were better served by customary based systems (Juma, 2004).

## III. METHODOLOGY

### 3.1 The study area

This study was conducted in Greater Kordofan State, Sudan. It is sharing a border with the Republic of South Sudan and covers an area of nearly 380,000 km<sup>2</sup> from total Sudan's territory. It's extended from semi-arid vegetation at north to poor and rich Savannah in the south (Kamal Eldin, et al 2015). Agriculturally, Greater Kordofan State is one of most producing areas

of agricultural crops in Sudan. It has highly fertile soil that supports the cultivation of different cash crops. Similarly, the state has abundant livestock comprises of main cattle. Populations in Greater Kordofan State were estimated to be around 4.2 million people, 75% of these population are living in rural areas (Fatih, et al. 2007). Farming and grazing are the major activities of the people.



**FIG.1. Location of Greater Kordofan in Sudan**

## 3.2 Data collection

### 3.2.1 The primary data

Primary data for this study were collected using various means such as a questionnaire, schedule interview, group discussion, cases as well as observations. 19 villages in Greater Kordofan State have recorded a higher conflict incidence between farmers and nomads. Out of these villages, 5 villages were randomly selected, namely: Umdam, Tongaro, Habila, Dallang, and Abu Kirais and they are most associated with farmers and nomads conflicts according to local government records.

### 3.2.2 The secondary data

The secondary data were collected from various resources such as research articles and published and non-published reports and documents from related institutions.

## 3.3 Data analysis

The analytical procedure used in this study was a descriptive statistic method in order to identify effective local ways using by respondents (farmers and nomads) for conflict resolutions over land-use rights in Greater Kordofan that helped to classify the responses into meaningful categories. Statistical Package of Social Science (SPSS) was used as tool for analysis. Qualitative data has been analyzed using content analysis (CA) technique. Data broke down into smaller meaningful units of information and tendencies then analyzed in details. CA is one of the numerous research methods used to analyze text

data(Ziran BAI, 2018). The content analysis describes a family of analytic approaches ranging from an impressionistic, intuitive, interpretive analysis of systematic, strict textual Analysis (Tavish, Pirro, 1990).

**TABLE1**  
**THE SELECTED VILLAGES FOR FIELD SURVEY (SAMPLE SIZE) IN THE STUDY AREA**

village	Population per village	Percentage $P = \frac{Pv}{Tp} \times 100$	Questionnaires number per village $Qn = \frac{ss \times p}{100}$
Umdam	500	33.3%	50
Tongaro	250	16.7%	25
Habila	200	13.3%	20
Dallang	350	23.4%	35
Abu Kirais	200	13.3%	20
Total	1500	100%	150

Where:

SS: Sample size; TP: Total population; Qn: Questionnaires number per village; P: Percentage; Pv: Population per village

#### IV. RESULTS

**TABLE 2**  
**THE SOURCE OF LAND USE CONFLICT AMONG THE RESPONDENTS.**

Source of land use conflict	Frequency	Percent
Crop damage by livestock	89	59.3
The war in South Kordofan	17	11.3
The impact of rain shortage	5	3.3
Expansion in mechanized agriculture	39	26.0
Total	150	100.0

Source: field survey, 2017.

Table 2 shows the Crop damage, by livestock, was the main cause of conflict between farmers and nomads with percentages of 59.3 %.

**TABLE 3**  
**THE WAY OF CONFLICT RESOLUTIONS BETWEEN THE RESPONDENTS.**

Types of resolutions	Type of the respondent		Total
	Farmers	Nomads	
Use of force	30.8%	69.2%	100%
Resort to local court	73.3%	26.7%	100%
Resort to local traditional system	80.9%	19.1%	100%

Source: field survey, 2017.

Table 3 shows that 80.9% of the farmers tend to solve the conflict through tradition local council system, while 69.2% from the nomadic were using force as the way of conflict solutions.

**TABLE 4**  
**FARMERS-NOMADS OPINIONS AND STRATEGIC PLANS CAN BE MADE IN ORDER TO END CONFLICT OVER LAND USE RIGHTS.**

Types of solutions	Type of the respondent		
	Farmers	Nomads	Total
Enacting deterrent law	76.9%	23.1%	100%
Organize mechanized agriculture	44.1%	55.9%	100%
Stopping the war in South Kordofan	89.7%	10.3%	100%

*Source: field survey, 2017.*

Table 2 shows that 89.7% of farmers claim that collecting weapons is the only way of stopping the war in Greater Kordofan. 55.9% of the nomads stated that organizing mechanized agriculture is the best solution for stopping the conflict.

**TABLE 5**  
**CASES ILLUSTRATING THE MAIN CAUSES OF CONFLICTS, AND THE LOCAL SOLUTIONS FROM THE RESPONDENT'S POINT OF VIEW IN GREATER KORDOFAN.**

Case 1	
Name of the location	Gouz locality- Tounjaro and Seligem villages
Type of conflict	Conflict over land use rights between farmers and nomadic
Consolidated narrative of the conflict	<p>This case was based on the group interview with farmers and nomadic. Tounjaro and Seligem villages are considered as semi-desert lands and the majority of the population, Arab or mixed with some Nubian tribes. In these areas practicing agriculture is major source of livelihood.</p> <p>Recently, the number of farmers is increased, and this factor plays a major role in triggering the conflict between farmers themselves, on agricultural land use rights. This population puts more pressure on the limited land and scarce natural resources that created a good environment for conflict between the farmers and nomadic.</p> <p>The land tenure within the tribe system the right to use only and is not allowed to sell to other tribes and especially nomadic.</p> <p>The conflict over land use rights between farmers and nomadic is increasing day by the day, these conflicts caused by the last one attacking farms and goes inside agricultural borders. Agricultural borders are not demarcated in Sudan because most of the rain-fed land is not registered. Sometimes land erosion works to erase the traditional boundaries that built by farmers on the ground. This situation is pushing farmers into conflict.</p> <p>Poor range land and inadequate forage sometimes leads the nomads to infringement of farmers land; this situation always leads both sides to the conflict. However, farmers don't want to release the croplands to nomads in good time at the onset of the dry season. This delay is caused in part by the planting of late crops. The fact that many farmers leave the late crops unfenced makes them more potential trouble spots for nomadic coming from seasonal migration areas.</p>
Causes of conflict as given by farmers and nomads.	<p>1- Lack of agricultural land.</p> <p>2- The conflict between farmers themselves caused by the agricultural borders.</p> <p>3- Poor rangeland and inadequate forage sometimes lead the nomads to Infringement of farmers' land.</p>
The local solutions are given by farmers and nomads.	<p>1-Vertical expansion in agriculture</p> <p>2- The tradition meeting system mechanisms called (Judiah) headed by elders (local council) from both sides of the conflict</p> <p>3-(Hakama), women singers and poets who are said to influence the people from both sides to engage in conflict violently, through their songs and poetry. But sometimes they have a negative role in the conflicts.</p>

*Case study Gouz locality: 2017.*



**TABLE 6**  
**CASES ILLUSTRATING THE MAIN CAUSES OF CONFLICTS AND THE LOCAL SOLUTIONS FROM THE RESPONDENT'S POINT OF VIEW IN GREATER KORDOFAN STATE.**

Case 2	
Name of the location	Habila scheme
Type of conflict	Conflict over land use rights between farmers and nomads.
Consolidated narrative of the conflict.	This case was based on the group interview with farmers and nomads which were officially documented. Expanding mechanized agriculture is reduced in the area of open rangeland and occupying the routes traditionally used by nomads. Sometimes the farmers resorting to burning grazing land, with considerable damage to the environment, so that the area would not attract nomads. Farmers also reported several incidences of threats by young nomads carrying arms when confronted by farmers whose cultivated areas are encroached upon.
Causes of conflict as given by farmers and nomads.	1-Unregulated expansion in mechanized agriculture. 2-Burning agricultural lands to keep the nomads away 3- Nomads carrying modern weapons 4- Conflicts over crop damage from nomads.
The local solutions are given by farmers and nomads.	1-Vertical expansion in agriculture 2- Organize mechanized agriculture determines areas for grazing. 3- Determines areas for grazing

*Case study Habila scheme: 2017.*

**TABLE 7**  
**CASES ILLUSTRATING THE MAIN CAUSES OF CONFLICTS AND THE LOCAL SOLUTIONS FROM THE RESPONDENT'S POINT OF VIEW IN GREATER KORDOFAN.**

Case 3	
Name of the location	Dallang
Type of conflict	The conflict between Arab nomadic and Nuba tribe.
Consolidated narrative of the conflict	This case was based on the group interview with Nuba farmers and Arab nomadic and official documents from DillangPrison.  The conflict between the Sudanese government and Sudan Peoples' Liberation Movement (SPLM) forces increased, and SPLM forces occupied the rich grazing areas in South Kordofan, which used to be a good grazing area for Arab nomadic from South Kordofan and other tribes. The occupied areas contained important stock routes for the nomadic tribes who are allied with the government that has used them as militias in its fight against (SPLM). According to Arab nomads, the insecurity generated by the civil war, in the South Kordofan, and by more localized conflicts, began to push nomads to move in larger groups, which in turn leads to overgrazing and to a greater likelihood of conflict with other resource users. For instance, growing numbers of Nubian farmers are reported to deliberately burn rangeland to keep nomadic away from their land, ostensibly to defend themselves and their crops and to avoid conflict.
Causes of conflict as given by farmers and nomads.	the conflict between SPLM forces intensified, and SPLM forces occupied the rich grazing areas in the far south of South Kordofan, which used to be a good area for grazing.
The local solutions are given by farmers and nomads.	1-Farmers-nomads individual and tribal alliances have a good role in the past concerning peacekeeping in the study area. 2-Collect modern weapons from the hands of farmers and nomads especially from the Arabian nomads. 3- Strengthening the role of local administrations in South Kordofan because all farmers and nomads are respecting the local traditional system more than the government. 4- Stopping the war in South Kordofan and enforce the law

*Case study Dallang: 2017.*

## V. DISCUSSION

Due to ethnic group variations and tribal in greater Kordofan, our study found that each and every tribal group have their own ways of solving conflicts and many other related issues. However, there are some similar ways that were found between the different tribes due to social and cultural interaction, while all of them do not tend to solutions that come from the local government. Table 3 showed 80.9% of farmers preferred that solutions made by local traditional council system. Whereas in some cases like murder, farmers tend to seek solutions by judiciary system (local courts). Almost 69.2% of the respondent (nomadic) was trying to use forces when conflict occurred with farmers over land in grazing areas across the study area. These results are consistent with many studies in African countries, for example, Adeoye (2017) reported that 32.5% of nomadic had violent conflicts with farmers over land use. However, in some cases, farmers have shown their desire for non-governmental solutions that come out from the local traditional council. In greater Kordofan particularly, in Tongaro and Umdam villages, the results demonstrated that crops damage by livestock is the major cause of conflict. This result coincided with a study carried out in the same area which highlighted that an attack usually occurs around agricultural land. Moreover, the study showed that most of the nomads are young people. So far, during last decade the conflict incidents were increased remarkably around the villages and towns. That is due to availability of mobile network services around these areas, and most of the nomads have adopted this technology and they need to be nearby the network's coverage.

Based on the case analysis, for instance, case3: Majority of the population in Nuba Mountain are non-Arab. Farmers and nomads in this area were fully dependent on solving conflict using local spiritual way locally called (Al-kijour). Through interviews with elder people, the study found that those people they are believed deeply in Al-kijour as the means of conflict resolutions and reconciliations. In the past, alliances between Nuba tribes and Arab nomads have had a significant impact on conflict resolution over land-use rights in Nuba mountains areas. Now, after the revolution of education in Nuba Mountains, Especially among new generations, we found that the situation is quite different than that in the past which based on Al-kijour. Recently, in Nuba Mountains, there is a war between the Sudan people's liberation movement (SPLM), and the Sudanese government. The ongoing war has affected the agricultural and rangeland severely, the majority of people has become dependent on foreign aid and has left their jobs due to insecurity. However, elders have reported that the situation right now is very complicated because almost most of the population was armed with modern weapons that fuel the war intensively. In some cases, those affected by the abuse resort to government courts were collapsed to old alliances with Arab nomads. It can be for alliances between the indigenous people of Nuba, and nomadic Arabs, they play an important role in resolving conflicts over land use rights. The results in Table 4 and Case 4: depicted that the regulations of mechanized agriculture are the best solution to avoid conflict over land use rights. In fact, there are nomad's routs in Greater Kordofan were delineated by local government, while farming with mechanized and traditional rain-fed agriculture is often expanded. The expansion of agriculture has blocked the nomad's routs that lead to grazing inside the farms. This situation usually creates misunderstandings between them and conflicts. It was clearly can be seen in Table 4, 89.7% claim that in order to stop the conflict, all weapons should be collected especially from Arabian nomads which will reduce conflict occurrence in the study area.

In case1: the study illustrated that Women in the study area have a major role in the fueling conflict which were locally known as (Hacamat). Hacamat is women who encourage men to engage in fighting in terms of defending tribe assets and land. Sometimes Hakamat would play a negative role which would lead to murder between farmers and nomads. However, one of the most widely used mechanisms for solving a conflict between farmers and nomads is Judiah. Here, elders from both sides will meet, debate, investigate and then decide who started the offense, what are the losses in lives and wealth, and decide the best way of solving the issue.

In the past, there is an effective mechanism for resolving the conflict between farmers and nomads in Greater Kordofan, the alliance Mentioned by the respondents in the case1: alliance system, Farmers allow nomads to use their land after harvest, On the other hand, nomads care about farmer's animals in the rainy season.

## VI. CONCLUSIONS

The results of the study showed that the main causes of conflict in Greater Kordofan State between farmers and nomads are crop damage and destruction by livestock. Also competition on scare and limited pasture resources, livelihood style and on-going conflicts are other causes of conflict. Further, the study revealed that the local leaders from both sides have developed many strategies for coexistence with conflicts over land use rights as well local solutions and strategies to deal with conflicts such as (Judiah) negotiation that could be based on local traditions.

## ACKNOWLEDGMENTS

The authors would like to thank all the participants in this study for their responses and insight point of view regarding the conflicts. Also, we would like to thank the Ministry of Agriculture and Animal resources, north Kordofan State for providing some basic information.

## REFERENCES

- [1] Abdalla, Y., El, E., & Samat, N. (2012). Managing Scarcity in the Dryland of Eastern Sudan : the Role of Pastoralists ' Local Knowledge in Rangeland Management. *Resources and Environment*, 2(1), 55–66.
- [2] Abdalla, Y., & Elhadary, E. (2010). Challenges facing land tenure system in relation to pastoral livelihood security in Gedarif State, Eastern Sudan. *Journal of Geography and Regional Planning*, 3(9), 208–218.
- [3] Arezki, R., Bhattacharyya, S., & Mamo, N. *Centre for the Study of African Economies Resource Discovery and Conflict in Africa: What Do the Data Show? \* CSAE Working Paper WPS/2015-14.*, (2015).
- [4] Babiker, M. (2008). *Communal Land Rights and Peace-Building in North Kordofan Policy and Legislative Challenges*. Sudan-Khartoum.
- [5] Briceño-Garmendia, Cecilia, Karlis Smits, and V. F. (2009). *Africa's Infrastructure: A Time for Transformation*. Washington, DC 20433 USA.
- [6] Dlamini, t. n. (2015). *exploring the impacts of land tenure system change on the sustainability of common resources in swaziland by*. stellenbosch university.
- [7] Fatih, E., Siddig, A., El-harizi, K., & Prato, B. (2007). *Managing Conflict Over Natural Resources in Greater Kordofan, Sudan* : (No. 00711). Kordofan, Sudan.
- [8] Jerke, M. J. (2008). *Addressing Deep-Rooted Conflict: Guidelines Harvested from the Glenree Centre for Peace and Reconciliation, Republic of Ireland*. The University of Victoria.
- [9] Kamal Eldin Mohammed Fadli and Ali Elamin Abdallah Ahmed2. (2015). Farmers Perceptions towards Agroforestry Systems in Babanosa Locality, West Kordofan State, Sudan. *Sudan Journal of Desertification Research*, 7(1), 67–82.
- [10] Komey GK. (2009). Communal Land Rights, Identities and Conflicts in Sudan: The Nuba Question. *Human Rights*, (May).
- [11] McTAVISH\*, D. G., & PIRRO\*\*, & E. B. (1990). content analysis '. *Kluwer Academic Publishers.*, 245–246.
- [12] Munzoul, A. M. (2006). Sudan : Identity and conflict over natural resources. *Society for International Development*, 49(3), 101–105. <https://doi.org/10.1057/palgrave.development.1100284>
- [13] Nimir, M., & Elzein, A. (2015). *The Republic of Sudan Country Report*. Washington, DC.
- [14] Nkonya, E., Johnson, T., Kwon, H. Y., & Kato, E. (2016). Economics of Land Degradation in Sub-Saharan Africa. *A Global Assessment for Sustainable Development*. <https://doi.org/10.1007/978-3-319-19168-3>
- [15] FAO (2019). *fao crop and food supply assessment mission to Sudan*.
- [16] Ofuoku, A. U., & and Isife, B. I. (2009). Causes, effects, and resolution of farmers-nomadic cattle herders conflict in Delta state, Nigeria. *International Journal of Sociology and Anthropology*, 1(2), 047–054.
- [17] Olateju, M. A. (2010). Functional literacy empowerment for nomadic herdsmen in Osun State, Nigeria. *Language, Culture and Curriculum*, 23(2), 109–121. <https://doi.org/10.1080/07908311003797619>
- [18] Osagie, J., Funmilayo, A., Fred, A., & Samuel, E. (2010). Causes of conflicts in the Niger Delta region of Nigeria as expressed by the youth in Delta State. *Procedia - Social and Behavioral Sciences*, 5, 82–89. <https://doi.org/10.1016/j.sbspro.2010.07.055>
- [19] Reuveny, R., Maxwell, J. W., & Davis, J. (2011). On con fl ict over natural resources. *Ecological Economics*, 70, 698–712. <https://doi.org/10.1016/j.ecolecon.2010.11.004>
- [20] Roy, R. D. (2005). *Traditional Customary Laws and Indigenous Peoples in Asia*. <https://doi.org/10.1016/j.ijpe.2005.07.006>
- [21] Shanmugaratnam N. (2008). Post – War development and land wuestion in South Sudan. *I International Symposium on Resource Under Stress, African Centre for Peace and Development*. Kyoto Japan: Ryukoku University.
- [22] YA, E. H. (2007). *Pastoral Adaptation and Socio-Economic Transformations in the Butana Area - Al Gedarif State, Sudan*. University of Khartoum, Khartoum.
- [23] Ziran BAI, Y. J. (2018). Research on Value Realization Strategies of Online News Reporting-based on Analysis of Parts of the 2017 Online Journalism Awards Winners. *International Journal of Humanities and Social Sciences*, 10(4), 63–71.

# Uplifting Farmers Communities: A Training Needs Assessment

Nerisa N. Paladan, D.B.A.

Partido State University, Philippines

**Abstract**— *Educating farmers through training usually happen outside the formal learning institutions and it aims to contribute towards adult learning and improving their farming performances. This study focused on identifying the training needs and develops capacity training to improve farmers' association communities in their farming practices. A combination of internationally documented qualitative and quantitative research methods was utilized to capture the current knowledge and training needs of farmer's association communities and the importance they place on different agricultural practices, and also to understand the best and most efficient approach in transmitting agricultural knowledge. The study used mixed methods in gathering data such as interview, survey and focus group discussion. Findings indicated that farmers associations still desire to improve their present knowledge and give more importance on the following: crop production in water management, vegetable production in controlling pest and diseases, livestock in chicken production and disease management, and developing small business as their alternative livelihood. It also showed that the government extension services were the main provider and presentation during community meetings is the most preferred methods of farmer's association in receiving trainings. However, training needs and capacity training for the farmers' association communities required participation, cooperation and openness from the farmers towards their upliftment.*

**Keywords**— *Agricultural Extension Service, Capacity Training, Farmers Education, Farmers' Upliftment, Training Need.*

## I. INTRODUCTION

Knowledge and training enables farmers to escape from poverty by providing them with the awareness and skills to improve their agricultural produce and income (Ogundele et al., 2012). According to Shibu & George (2013), training is planned activity intended to enhance the knowledge, skill and competencies of the farmers for the refining his/her performance, and this might be useful for reaching the required level of knowledge and skill. In developing effective training it requires a comprehensive knowledge of the training need of the target beneficiary or group. Barbazett (2006) mention that it is essential for the training institution to determine who, what, when, where, why and how of training before any actual training is conducted.

In several situation, at the national level or the organization identified the training needs of the farmers without considering the particular needs and preferences of farmers themselves. That frequently results in a gap between training program and methods and the particular needs of farmers in relations of their knowledge, skills and interest. Ageogun et al., (2013), state that training needs assessment can determine the "gap" between existing performance and required performance, and search the source and details of the gap and methods for terminating or removing it. The individual farmers require training on their skills, knowledge and attitudes to overcome challenges as well as to minimize creating problem circumstances in their farming practices. Meenambigai and Seetharaman (2003) emphasized that training is the utmost singular reason affecting farmers' attitude, productivity, improvement, minimization of risks. In a need analysis this can recognize more than one training needs that should be a priority and consider to a formal training plan or to make a record for future training. The concept of need assessment is the process used to determine if training is necessary. Problem identification and definition is the start of needs analysis. Determining whether training is needed and to specify what that training should provide is the main step in any training program. A needs assessment that considers the views of farmers is necessary to guarantee that the design and development of training programs meets the needs of the farmers which it aims to serve.

A farmer training is an education that customarily takes place outside formal learning institutions and it hopes to lead towards adult learning and improving performances. Training has an crucial role in the advancement of human performance just like the farmers since it provides a systematic advances of knowledge and skill and these developments are useful in working proficiency of learners (Sajeev, 2010).It therefore necessitates an approach that takes the course of the 'situations', rather than 'subjects'. Contrary to conventional education in which the student is required to adjust him or herself to an established curriculum, the curriculum in adult education is built around the students' needs and interests (Sajeev, M.V.

Singha, A.K. and Venkatasubramanian, V., 2012). This highlights the significance of getting it right, ensuring that both the subject matter and approach are suitable and relevant to farmers.

According to Qamar, (2005), most of the training of farmers becomes part of agricultural extension, which can be defined as the provision of need and demand-based agricultural knowledge and skills to rural men, women and young people in a non-formal and participatory manner to help improve their quality of life. Agricultural extension generally consists of three basic tasks: disseminating useful and practical information relating to agriculture and home economics, supporting farmers to practically apply that knowledge to analyze their problems, and assisting farmers to use the technical knowledge to better solve their farming constraints (Zakaria, 2010). However, such initiatives are not capable to discontinue completely the gaps of the dysfunctional community research and extension systems that are mainly intended to help smallholders and other people in deprived areas with the establishment of value agricultural services (World Bank 2012).

Smallholder farmers can take advantage of a tailored training as part of agricultural extension, to achieve sustainable agricultural activities. This extension facilitates farmers to accept firsthand innovations, to advance their production, income, and to care for the environment. However, there is an unlimited variety occurs in farmers' access to extension services, at the same time the quality of services provided. Likewise, methods used to carry out the extension services and the topics designs are not always suitable to the need of the farmers. Understanding the training needs of farmers allows extension providers just like the agribusiness incubation center to improve, customize extension services to efficiently extent and benefits farmers' communities.

The availability of services for small farmers is mostly attributed from the support of private donors and non-government organizations, since government agricultural services are minimal. Improved coherence and stronger partnerships can advance the worth and influence of capacity development in innovation systems as shown in the practice (The World Bank 2012, Ludemann et al. 2012, Juma 2011, The World Bank 2007). Though, harmonization of services is limited, mainly at the sub-national level, frequently it results in replication of services and ineffective use of resources (Santoyo Rio, 2013). To minimize the duplication of services and inefficient use of resources the training needs assessment in this study is crucial.

The training needs assessment is an essential start-up activity of the Agribusiness Incubation center of the Partido State University- Salogon campus towards uplifting farmers' association communities for the sustainability of agriculture and agribusiness for its rural development. The main purpose of this study is to identify the training needs and develop capacity training of the farmer's community in San Jose, Camarines Sur. It also identifies the socio-demographic and farming characteristics of the farmer's community and recognizes its agricultural activities. Similarly, it classifies the extension providers and the preferred methods of farmer's community. Issues affecting delivery of training of farmer's community were also assessed. Furthermore, the findings of the study will be used to develop capacity training on topics in which farmers expressed a need for training and the method of delivery necessary to reach them and this will form part of the services of the agribusiness incubation center. Where training is a fundamental part of any growth activity (Pandey et al., 2015) of the farmers. Likewise, these add knowledge in capacity development training and agricultural extension services.

## II. METHODOLOGY

This study was conducted in the town of San Jose, Camarines Sur where farming is the main livelihood. They also have a sufficient farm harvest to address the food sustainability of the town, but the farmers still aim to improve their farming livelihood where this study seizes the opportunity to assess the training needs of the farmer's community and develop capacity training. The populations of the study are the members of the active farmer's association and cooperative in San Jose, Camarines Sur where they have already received agricultural trainings and continuously availing the agricultural extension provided by the Department of Agriculture. Using sloven formula a sample of 265 respondents was identified in this study. It applied random and purposive sampling procedures. Purposive sampling to identify the farmer's respondent from the association and cooperative. The Department of Agriculture of San Jose, Camarines Sur provided the list and recommend active farmer's association and cooperative.

It utilized both qualitative and quantitative research design that includes survey and focus group discussion with key informant in the farmer's association. Data were collected through a survey with a structured questionnaire, interview and focus group discussion. Personal knowledge (competence) on the different areas of agricultural training needs was self-assess by the farmer's and they rate the importance of the training needs. It uses a five likert-type scale ranging from none to very high to measure the level of current knowledge of the farmer's respondent. In considering the importance of training needs a three point likert-type scale with response options ranging from not important to very important was used.

The respondents of this study are the small scale farmer's whose earnings comes majority from agricultural activities. Oral consent was provided by the farmer's respondent to participate in this study after a short orientation of the research objectives. Confidentiality was assured on their responses and also the voluntary nature of the interviews.

The research questionnaire used in this study was developed based on published literature on training needs assessment. The first part of the questionnaire was the demographic and farming characteristics of the respondent that includes sex, age, education, household size, farming experience, size of agricultural land, land ownership, agricultural activities and annual farm income. Followed by the major training needs components identified in this study such as crop production, vegetable production, fruit growing and livestock. Detailed training needs were included in each training needs components. The other parts of the questionnaire are about the main providers and the frequency of agricultural extension advice and their preferred method and time to receive extension services. Lastly, a space was provided for the other answers and comments.

Descriptive statistics such as frequencies, percentage and mean were used to analyze the data. Frequency and percentage was used to analyze demographic and farming characteristics. Borich model (1980) one of the most used models for assessing training needs in agricultural education and extension were utilized in this study. In this model, a weighted discrepancy score was calculated for evaluation and ranking of farmer's training needs. A Mean Weighted Discrepancy Score was computed to describe the overall ranking for each of the training areas. The competency that has the highest scores was considered the highest need and priority for training.

### III. RESULTS AND DISCUSSION

#### 3.1 Socio-Demographic and Farming Character of the Respondent

**TABLE 1**  
**SOCIO-DEMOGRAPHIC CHARACTERISTICS OF THE FARMER'S RESPONDENT**

Personal Characteristics			Farming Characteristics				
Characteristics	F	P	Characteristics	F	P		
<b>Sex</b> Male Female	177 88	67% 33%	Farming experience (years)				
			Less than 3	7	3%		
			3 to 5	13	5%		
			More than 5	241	92%		
<b>Age (Years)</b> Less than 30 30-39 40-49 Above 50	3 9 49 204	1% 3% 18% 77%	Land ownership				
			Own all	82	31%		
			Lease all	24	9%		
			Part own/part lease	157	60%		
<b>Education</b> No formal education Not finished primary school Completed primary school Completed high school Higher than high school	0 72 97 12 83	0 27% 37% 5% 31%	Size of agriculture land (ha)				
			No Land	2	1%		
			Less than half	31	12%		
			0.5 to 1	131	49%		
			1 to 2	59	22%		
			2 to 3	23	9%		
			3 to 4	8	3%		
More than 4	12	5%					
<b>Household members</b> 1 2 3 4 5 6 or more	9 41 42 42 46 83	3% 16% 16% 16% 17% 32%	Percentage of yearly income from agricultural activities				
			Less than 25%	50	19%		
			25% to 50%	142	53%		
			50% to 75%	57	22%		
			More than 75 %	16	6%		

Table 1 showed that the personal characteristics of farmer's respondent are majority male which is 67%, with age range 50 years old and above which is 77%, in terms of their educational level majority completed primary school which is 37% and household is composed of 6 or more members. Since majority of the farmers just completed primary school, developing capacity training would help them increase their farming knowledge. It was observed that farming is still dominated by men although there are a growing number of women which is 33% of the respondent who engaged themselves into farming however, there are few young farmers. These created a challenge to the farming industry for the food sustainability since farmers are getting old and few young farmers are engaging into farming. But it is interesting to note that there is a large number of farmers who reach higher than high school, this indicated that some professionals and college graduate are attracted to engage in farming as a business farmers and this could be a hope for the farming industry.

Table 1 also showed the farming characteristics of the farmer's respondent that majority has more than 5 years farming experienced which is 92%, they partly own and lease the land that they farm which accounts for 60%, the size of their agricultural land for farming is majority half to one hectare and the percentage of their yearly income from agricultural activities is between 25% to 50%. It was noticed that only few farmers have less than 5 years farming experience which is 8%. This means that farmers' respondents are well experienced in terms of farming but still open to new technology and methods to improve their productivity. It was also observed that there is a decreasing size of land used for agriculture and produces less than 50% of farmer's income. These indicated that farmers nowadays are not anymore relying their income from farming and they have alternative livelihood to augment for their family needs.

### 3.2 Agricultural Activities of the Farmers Respondent

**TABLE 2**  
**AGRICULTURAL ACTIVITIES OF FARMERS RESPONDENT AND ITS MAIN PURPOSE**

Agricultural xActivity	N	P	Purpose		
			Own Consumption	To Sell	Own Consumption and to sell
<b>Crop production</b>					
Rice	273	51%	16%	10%	74%
Maize	15	3%	33%	33%	33%
Cassava	50	9%	94%		6%
Pepper	4	1%	50%		50%
Other – Peanuts	1	0%		100%	
<b>Vegetable production</b>	103	19%	68%	17%	15%
<b>Fruit growing</b>	86	16%	95%		5%
<b>Livestock</b>					
Carabao	32	7%	97%	3%	
Cows	53	12%	77%	17%	6%
Chickens	144	32%	90%	1%	8%
Ducks	94	21%	91%	3%	5%
Pigs	119	26%	68%	22%	10%

Majority of the farmers respondents are engaged in rice production since rice farming is the main livelihood in the town both for their consumption and to sell as reflected in Table 2. Their agricultural activity is followed by livestock of chicken, pigs and ducks but mostly for their consumption and minimal for selling that is also true to their vegetable production and fruit growing. It was observed that their livestock are majority for their consumption since once they sell the livestock alive they could not demand for a higher price and for the vegetable during harvest time there is an oversupply so prices goes down. Because of this farmers' are discouraged to plant vegetable for selling but still they engaged in vegetable production as a strategy when water is not available. For the farmers, if they could not plant rice because there is no water then they could still plant variety of vegetable that requires less water.

In the agricultural activities, farmers encountered several challenges in farming. Table 3 showed the main problems encountered by farmers in their agricultural activities. The top five are the following the high cost of inputs, pests and diseases, lack of capital and credit, low prices when they sell their harvested products and drought. It was observed these top five concerns of the farmers' respondent are the recent issues of most of the farmers' around the world. Farmers' are challenged by the high cost of inputs and when they sell their harvest the price are low. The situation calls for the farmers to



add value to their harvest so that they could sell at competitive price. The farmer sector is confronting several challenges that reduce the farm produce (Sattar, 2012). While they have less concern on crop insurance needs, training needs, low harvest, limited experience and poor soil in their farming activities. It was noticed that farmer's respondent are less aware of the importance of insurance in their farming activity particularly during calamity like drought during summer. The low harvest could be attributed to the pest and disease. The poor soil is because the land in some area of San Jose, Camarines Sur is mix of sand and soils particularly those areas near the coastal.

**TABLE 3**  
**MAIN PROBLEMS ENCOUNTERED BY FARMERS IN THEIR AGRICULTURAL ACTIVITIES**

Problem	P	Rank	Problem	P	Rank
High cost of inputs	14.96%	1	Lack of Markets/information	1.18%	11
Pests and Diseases	14.65%	2	about markets		
Lack of capital and credit	12.76%	3	Poor soil	0.94%	12
Low Prices	12.28%	4	Limited knowledge of how to	0.63%	13
Drought	8.11%	5	use fertilizer		
Labor	7.24%	6	Limited experience in farming	0.24%	14
Changes in weather	7.24%	6	Other - low harvest	0.08%	15
Other - water supply	6.61%	7	Other - training needs	0.08%	15
Lack of tools and equipment	6.54%	8	Other - insurance needs	0.08%	15
Floods	4.65%	9			
Poor or insufficient training	1.73%	10			

### 3.3 Training Needs of the Farmers' Respondent

This study assessed the training needs of the farmers respondent that reflected several topics in agricultural production which the farmers articulated a need for training. From a pre-designed list were all area of training the respondent signified their interest, they were asked to choose and specify their perceived current knowledge and the importance of the area for them. In Table 4 to 9 it shows the weighted mean and ranked of each discipline of the training needs of the respondent. The most important trainings needs of the farmers were determined by the highest rank.

To determine the highest rank of training needs it uses the mean weighted discrepancy score (MWDS). Table 4 indicated that crop production has the highest rank it means the farmers respondent still need more training for crop production to improve their harvest productivity and since this is their main livelihood. Then, the livestock and vegetable production of the respondents were they have a lesser extent need for training in this area. Since, it was observed that livestock and vegetable are more for their family consumption. On the other hand, fisheries and fruit growing were ranked low as perceived by the farmers. Most of the farmers are not engaged in fishing so they don't see a need for training in this area. For fruit growing, farmers considered this as a backyard plant not intended for generating income.

**TABLE 4**  
**TRAINING NEEDS OF THE FARMER'S RESPONDENT IN ALL AREAS**

Areas	Mean (Weighted)				
	Knowledge	Importance	DS	WDS	WDS Rank
Crop production	2.97	4.89	1.91	9.34	1
Vegetable Production	1.64	3.23	1.59	5.12	3
Fruit Growing	1.00	2.41	1.41	3.41	5
Livestock	1.88	3.54	1.67	5.91	2
Fisheries	64.	2.02	1.38	2.79	6
Food Processing	0.87	2.34	1.47	3.44	4

In the crop production, the top three areas were the respondent signified a need for training are water management, control pest and disease and using new technology in farming (see Table 5). Water management has the highest rank which indicated that respondent signified trainings for water management since this limit them for their production cycle particularly in rice production that needs more water. Next, respondent see the need for training of controlling pest and disease to minimize damage of their crop. For the farmers pest and disease affect the profitability of their agricultural activities and controlling it

could increase their productivity. Lastly, respondent are after on training using new technologies in farming to upgrade their farming practices.

Table 6 and 7 showed the training needs of the respondent in vegetable production and fruit growing. It was noticed that both in vegetable production and fruit growing they have the same the top three areas were they expressed a need for a training such as control pest and disease, water management and fertilizer use. For the farmers, they need to learn more how to control pest and disease because this affects profitability of their agricultural activities and this could help them in cost-effective way to increase agricultural productivity. Concerned on water management creates a challenged to the respondent in their vegetable production and fruit growing since they need water as the plants are growing. Also, farmers must be able to choose which fertilizer to use that will help their vegetable and fruits to generate more harvest and less mortality. Therefore, farmers recognized the need to have training in fertilizer use.

**TABLE 5**  
**TRAINING NEED OF FARMER'S RESPONDENT IN CROP PRODUCTION**

Areas	Mean (Weighted)				
	Knowledge	Importance	DS	WDS	WDS Rank
Selection and buying inputs	2.54	4.27	1.73	7.37	9
Preparing land for planting	2.59	4.34	1.75	7.58	7
Method of planting	2.59	4.36	1.77	7.71	5
Fertilizer use	2.58	4.34	1.76	7.63	6
Control of pests and diseases	2.67	4.47	1.8	8.04	2
Harvesting	2.48	4.23	1.74	7.37	9
Post-harvest activities (e.g. drying, milling)	2.45	4.2	1.75	7.37	9
Crop diversification(trying new crops)	2.52	4.33	1.82	7.88	4
Water Management (Irrigation)	2.69	4.53	1.84	8.36	1
Using New technologies	2.5	4.34	1.84	7.97	3
Marketing	2.47	4.25	1.78	7.55	8
Other		1.03	1.03	1.05	10

These challenges can be undertaken by giving capacity building and training opportunities to deprived farmers with the pledge that they would be able to build up their skills, capabilities (KGF, 2011) and approaches for sustainable agriculture development (Power and Maclean, 2011)

**TABLE 6**  
**TRAINING NEED OF FARMER'S RESPONDENT IN VEGETABLE PRODUCTION**

Areas	Mean (Weighted)				
	Knowledge	Importance	DS	WDS	WDS Rank
Selection and buying inputs	1.47	3.12	1.65	5.16	8
Preparing land for planting	1.58	3.27	1.68	5.50	6
Method of planting	1.81	3.55	1.73	6.15	4
Fertilizer use	1.82	3.56	1.74	6.20	3
Water Management (Irrigation)	1.79	3.58	1.79	6,42	2
Control of pests and diseases	2.08	3.96	1.88	7.44	1
Harvesting	1.50	3.16	1.65	5.22	7
Marketing	1.53	3.26	1.73	5.62	5
Other	0.08	1.28	1.2	1.54	9

It was observed that in crop production, vegetable production and fruit growing the respondent have common areas that they articulated a need for training. These are water management and control pest and disease. Water management since this affects the rice production, vegetable production and fruit growing. Farmers are dependent on the water irrigation and rain as a source of water for their farming. It was noted that these create a challenged to the farmers to strategies on choosing which to plant, rice or vegetable and which variety of vegetable to plant for a particular season that will require less water. Pest and disease is another thing, since farmers viewed this as main obstacle to their agricultural production were the effects on crops

is evidently noticeable. These findings is similar to the remark of Barman et al. (2013) who reported pest and disease management, and water management were included in the top five important training need area that majority farmers had high level of training need.

Livestock is the second areas were the respondent showed interest for training. It was observed that livestock becomes a compliment to the farming activities of the farmers and as a source of some of their income. Training needs for chicken emerged as the most important area for the respondent (refer to Table 8). This was followed by disease management and pigs. It was observed that the common backyard livestock the farmers had are chickens and they are challenged on how to deal with its diseases. Few respondents showed interest on animal feeding, housing and others which may reflect that farmers just rely on their basic knowledge on how to feed animals and the simple housing they provided to their livestock.

**TABLE 7**  
**TRAINING NEED OF FARMER'S RESPONDENT IN FRUIT GROWING**

Areas	Mean (Weighted)				
	Knowledge	Importance	DS	WDS	WDS Rank
Selection and buying inputs	1.25	3.22	1.97	6.33	7
Preparing land for planting	1.23	3.22	1.99	6.40	6
Method of planting	1.49	3.55	2.06	7.30	4
Fertilizer use	1.66	3.78	2.13	8.05	2
Water Management (Irrigation)	1.59	3.72	2.13	7.94	3
Control of pests and diseases	1.92	4.15	2.23	9.27	1
Harvesting	1.19	3.17	1.98	6.27	8
Marketing	1.25	3.29	2.04	6.74	5
Other	0.00	1.49	1.49	2.22	9

**TABLE 8**  
**TRAINING NEED OF FARMER'S RESPONDENT IN LIVESTOCK**

Areas	Mean (Weighted)				
	Knowledge	Importance	DS	WDS	WDS Rank
Chickens	2.29	4.13	1.84	7.61	1
Pigs	2.32	4.14	1.82	7.55	3
Cows	1.53	3.24	1.70	5.50	6
Ducks	1.63	3.37	1.74	5.86	5
Disease Management	2.11	4.00	1.89	7.57	2
Housing	1.48	3.19	1.71	5.46	7
Animal Feeding	1.62	3.26	1.65	5.37	8
Floods/disaster Management	1.48	3.29	1.81	5.97	4
Other	0.05	1.27	1.22	1.55	9

Aside from agricultural training needs farmers' respondent also indicated training for small business development, forming and managing self-help groups and handicrafts as reflected in Table 9. Majority of the farmers' respondent are interested to develop and start a small business so that this could help augment to their family income. Since income from farming nowadays are not enough and reliable. They also realized the need for training in forming and managing self-help groups particularly among the farmers. The government had been encouraging the farmers to form association or cooperative so that they could support each other and since most of the programs of the government for the farmers are intended to groups or association. Another is they also wanted to have a training in handicraft they see this as an opportunity to learn and possible alternative source of income. Likewise, they also realized that they need training for managing their finances. This could help them improve how to manage their limited resources. It was noted that farmers are now becoming aware that even if they have limited finances it is still important to manage it.

**TABLE 9**  
**TRAINING NEED OF FARMER'S RESPONDENT IN OTHER AREAS**

Areas	Mean (Weighted)				
	Knowledge	Importance	DS	WDS	WDS Rank
Forming and managing self-help groups	2.28	4.29	2	8.6	2
Managing finances	1.73	3.53	1.81	6.38	4
Handicrafts	1.44	3.41	1.97	6.72	3
Small business development	2.12	4.29	2.08	8.75	1
Other	0.01	1.31	1.30	1.71	5

### 3.4 Agricultural Extension Providers and methods of the Farmers' Respondent

Furthermore, this study identified the extension providers, extension advice received and methods preferred by the farmer's respondent for their training needs.

In the focus group discussion, farmers' respondent stated that the main extension providers they have are the Department of Agriculture (DA), other farmers and the input suppliers. The Department of Agriculture provides several agricultural extension services such as farmers' field school, hybrid inputs, and free crop insurance to name few of their services. But the DA extends these services to the farmers who are members of farmer's association. On the other hand, some farmers provide services to their fellow farmers particularly if they have new technology, methods in farming, new variety of crop and a better fertilizer. Also, input supplier extends services to the farmers specifically in lending farmers with the inputs they need for their farming activities.

It was noticed that almost of the farmers have received some form of agricultural advice or training which includes advice from other farmers that belongs to their association in their farming activities as capture in Table 10. It indicated that majority received agricultural advice or training in crop production and some in vegetable production, agricultural technology and livestock. Respondent received less advice or training in terms of marketing, fisheries, fruit production and no training for food processing.

This finding is similar to what Swanson and Rajalahti (2010) mention that part of the four major paradigm of agricultural extension is the technology transfer and non-formal education which majority of the farmers' respondent had experience already.

**TABLE 10**  
**AREAS OF EXTENSION ADVICE RECEIVED BY THE FARMER'S RESPONDENT**

Areas	F	P	Rank
Crop production	257	63%	1
Vegetable production	65	16%	2
Fruit production	4	1%	6
Livestock	30	7%	4
Fisheries	9	2%	5
Agricultural technology	35	9%	3
Food processing	2	0%	8
Marketing	4	1%	7
Other*			

*\*Includes new technology tools and organic farming.*

Table 11 - indicated that presentation during community meetings is the most preferred method of agricultural activities, followed by individual farm visit and written materials. TV and radio programs were not chosen by the farmer's respondent as method of agricultural activities. This reflected that farmer choose practical training methods to upgrade their learning capability, which was also articulated during the focus group discussion. Besides, TV and radio programs are sometimes not accessible in their area.

However, individual farm visit is an expensive methods according to Anandajayasekaram et al.(2008) where they pointed out that this method is expensive in terms of transportation cost and time consuming and only few farmers farm can be visited that resulted to limited farmers to reach out.

**TABLE 11**  
**PREFERRED METHOD OF AGRICULTURAL ACTIVITIES BY THE FARMER'S RESPONDENT**

Method	Male	Female	Total	Rank
On-farm demonstration	8%	7%	7.5%	5
Farmer field school	6%	5%	5.5%	6
Workshops	15%	15%	15%	4
Individual farm visits	24%	28%	24.8%	2
Written materials	19%	18%	18.5%	3
Presentation during community meetings	27%	25%	26%	1
TV programmes	-	-	-	-
Radio programmes	-	-	-	-

During the survey interview, farmers stated that they would like to receive training during summer period were water is not available and they cannot plant (in January to May) and would prefer to have the training early morning before the preparation of their lunch (between 8am to 10am) and for two hours only and at least once a week (refer to Table 12). Therefore, training can be best conducted early morning during summer period.

**TABLE 12**  
**PREFERRED TIME OF FARMER'S RESPONDENT TO RECEIVE EXTENSION SERVICES**

Period	Percent							
	Early Morning		Late Morning		Early Afternoon		Late Afternoon	
	F	P	F	P	F	P	F	P
Jan-May	109	57%	5	3%	78	40%		
Jun-Oct	21	57%	1	3%	15	40%		
Nov-Dec	12	54%	1	5%	9	41%		

### 3.5 Challenges affecting provision of training

The provision of extension services to farmers has several distinctive challenges both on the sources and the one requesting. For the requesting side, specifically with regards to availing, it was investigated in this study and captured in Table 13. The common hindrance encountered by the farmers in availing agricultural extension services was not being invited which is 32.5% this happen because they are not active members of the association or each association gets limited slot. Therefore slot for training are limited and given to selected members of the association. More than 17% expressed that they have limited knowledge about training opportunities as main hindrance. This is similar to the findings of Anandajayasekeran et al., (2008) where limited amount of information that can be distributed at a given time hinder the mass extension methods. Other hindrances include distance to training facilities, don't have land title, no time to participate/too busy, child care responsibilities and inadequate training staff.

It was noticed that men and women generally encountered the same hindrances in availing agricultural services. The difference was for men distance to training facilities is their 2<sup>nd</sup> hindrance while for women was the limited knowledge about the training opportunities. It only shows the men gets more access on the training opportunities than women. Interestingly, both men and women are affected by child care responsibilities in accessing to agricultural extension services.

**TABLE 13**  
**HINDRANCES ENCOUNTERED IN AVAILING AGRICULTURAL EXTENSION SERVICES**

Difficulty	Male	Female	Total	Rank
Low Literacy level	3%	2%	2.5%	7
No time to participate/too busy	11%	9%	10%	5
Limited knowledge about training opportunities	16%	19%	17.5%	2
Inadequate training staff	3%	2%	2.5%	7
Not invited	37%	28%	32.5%	1
Child care responsibilities	7%	9%	8%	6
Distance to training facilities	18%	15%	16.5%	3
Don't have land title	6%	16%	11%	4

These findings clearly indicated that farmers must be given equal chance to be invited to avail of agricultural extension services. Information about the training must be disseminated to all the farmers or to reach out with the farmers every time there are training opportunities. So that farmers could plan and organize ahead to attend, information about the dates, places of the training should be provided in advance. It could also bring the trainings to the place of the farmers so that they could attend and participate. It is also noteworthy to obtain feedback from farmers after the trainings they have received. This feedback can help improve the agricultural extension services.

#### IV. CONCLUSION AND RECOMMENDATION

The results of the study established that the training needs of farmers are generally significant that leads to proposing capacity development training and need for increased agricultural extension services in most of the agriculture and agribusiness areas. It also revealed that farmers used to qualified most of their agricultural challenges to restricted concerns such as water irrigation/management and pest and disease. It was recognized that during self-assessment of the farmers on their current knowledge it was reflected in most areas they rate themselves moderate despite decades of experience in farming and in the importance of topic as high. The reasons why farmers have this pattern of responses can be attributed to: first, lack of confidence of farmers when it comes to their farming knowledge. They are aware that their knowledge is not updated and upgraded. Second, they remain humble that despite they have the experience they still rate themselves moderate. Lastly, it showed that they are open for new knowledge in farming particularly the use of technology and new method.

Likewise, the study indicated that farmers are not aware of the several opportunities that can bring positive impact on their agricultural efficiency and earnings such as improved marketing skills to sell their harvest, using new technology in their farming activities which can increase their effectiveness and adding value to their harvested product, they could sell these products at competitive price. Therefore, it is vastly suggested that farmers be open to new ideas through hands-on methods. Farmers can network with other farmers that have implemented new technologies or practices to assist collaboration.

Furthermore, farmers revealed that they do not have the same levels of competence (knowledge) and different needs for future training across agricultural practices. Actual training needs for particular agricultural practices were shown using the Borich Need Assessment Model and the most important training need that was identified was water management/irrigation and control of pest and disease. These two areas was identified as the highest need across several areas – crop production, vegetable production and fruit growing and correlates with the second main agricultural difficulties farmers encounter. Lastly, farmers preferred hands-on learning method than academic lessons, appeals for training that is appropriate for their time and place, and address specific demands at home like child care.

The following recommendations are suggested based from the findings of the study:

- In developing capacity training for the farmers the following must be considered: training on water management (irrigation), and pest and disease management should be prioritized across all areas, also training on new technologies for crop production and on fertilizer use for fruit growing must also be given priority. Next, agricultural extension services and training for farmers must highlight hands-on training and reflection than academic training. Then, the best time to provide trainings to the farmers is during summer period (January to May) at early morning. Lastly, training on developing small business and financial management of the farmers must be given emphasize as these becomes the emerging trainings needs of the farmers. However, a frequent field survey to evaluate and monitor changes in the agricultural training needs of the farmers.
- Collaboration with the department of agriculture and other agriculture extension provider is recommended to avoid duplication and improve capacity development training for the farmers.

#### REFERENCES

- [1] Ageogun, S.O., Fapojuwo, E.O., Oyeyinka, R.A., Adamu, C.O. and Abiona, B.J. Training needs assessment of cocoa farmers' association members on soil management techniques in Cross River State of Nigeria. *Ethiopian Journal of Environmental Studies and Management*, 6(5), 2013, pp. 551–560.
- [2] Anandajayasekeram, P., Puskur, R., Sindu Workneh and Hoekstra, D. *Concepts and practices in agricultural extension in developing countries: a source book*. IFPRI (International Food Policy Research Institute), Washington, D.C., and ILRI (International Livestock Research Institute), Nairobi, 2008.
- [3] Barbazette, J. *Training Needs Assessment: Methods, Tools, and Techniques*. San Francisco: Pfeiffer CaffarellaRoemary S 2002, 2006.
- [4] Barman, S. K. Pathak and. P.K. Pathak. *Journal of Academic and Industrial Research*. 1(11),2013, p. 686.

- [5] Juma, C. *New Harvest: Agricultural Innovation in Africa*. Oxford University Press, New York, 2011.
- [6] Krishi Gobeshona Foundation-KGF 2011, 'Capacity Building of farmers through exporting comparative advantaged horticultural products,' Bangladesh Agricultural Research Council Campus, Farm Gate, Dhaka, Bangladesh, Technical Bulletin, Number 20, Available from: [accessed 4 March 2014].
- [7] Ludemann, R., van Dorp, M. Groot-Kormelinck, A. and Chancellor, T. *Capacity Development in Agricultural Research for Development*. Agrinatura, Paris, France, 2012.
- [8] Meenanbigai, J. and R K. Seetharamen.. *Training Needs of Extension Personnel in Communication and Transfer of Technology*. Agriculture Newsletter, No.48:19, 2003.
- [9] Qamar, M. K. *Modernizing national agricultural extension systems: A practical guide for Policy makers of developing countries*. Research, Extension and Training Division Sustainable Development Department, Food and Agriculture Organization of the United Nations, 2005.
- [10] Ogundele, OJK, Akingbade, WA & Akinlabi, HB. 'Entrepreneurship training and education as strategic tools for poverty alleviation in Nigeria', *American International Journal of Contemporary Research*, vol. 2, 2012 pp. 148-156.
- [11] Pandey R.K., et al. *A Critical Analysis on Training Needs of Farmers About Mustard Production Technology*. *International Journal of Agriculture Sciences*, ISSN: 0975-3710 & E-ISSN: 0975-9107, Volume 7, Issue 14, 2015, pp.-892-895.
- [12] Power, C & Maclean, R. 'Lifelong learning for poverty alleviation and sustainable development,' *International Symposium on lifelong learning: meanings, challenges and opportunities*, Available from: *Capacity Building and Training for Sustainable Livelihood of Farming Community in Pakistan EUROPEAN ACADEMIC RESEARCH - Vol. III, Issue 3, 2011 / June 2015 3095*, [accessed 3 April 2014].
- [13] Sajeev, M.V. *Capacity Building Through KVKs: Training needs analysis of farmers of Arunachal Pradesh Indian Res. Journal of Extension Education*,10 (1),2010, pp. 83-90.
- [14] Sajeev, M.V. Singha, A.K. and Venkatasubramanian, V. *Training needs of farmers and rural youth: an analysis of Manipur State, India. Journal of Agricultural Science*, 3(2): 2012, pp 103–112.
- [15] Santoyo Rio, E. *Capacity needs assessment of the agricultural extension system in Cambodia*. International Fund for Agricultural Development, 2013.
- [16] Sattar, T. 'A sociological analysis of constraining factors of development in agriculture sector of Pakistan', *Journal of Economics and Sustainable Development*, vol. 8, 2012, pp. 8- 24.
- [17] Shibu, K. J. & George A. *Assessing the training need of dairy farmers on scientific cattle management practices*. *International Journal of sciences and Research*, 2(7),2013, pp. 496-497.
- [18] Swanson, B.E. and Rajalahti, R. *Strengthening agricultural extension and advisory systems: procedures for assessing, transforming, and evaluating extension systems*. Agriculture and Rural Development Discussion Paper 44. World Bank: Washington, D.C.,2010.
- [19] The World Bank. *Agricultural Innovation Systems. An Investment Sourcebook*. Washington DC,2012.
- [20] The World Bank. *Cultivating Knowledge and Skills to Grow African Agriculture. A Synthesis of an Institutional, Regional, and International Review*. The World Bank, Washington, DC.,2007.
- [21] Zakaria, H. *Introduction to agricultural extension*. Department of Agricultural Extension, Rural Development and Gender Studies, Faculty of Agriculture, University for Development Studies, 2010.





**AD Publications**

**Sector-3, MP Nagar, Rajasthan, India**

**[www.adpublications.org](http://www.adpublications.org), [www.ijoeear.com](http://www.ijoeear.com), [info@ijoeear.com](mailto:info@ijoeear.com)**