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ASSESSMENT OF ECONOMIC BEHAVIOUR AND TREND OF
LIVESTOCK REARING OF THE FARMERS IN RURAL AREAS OF
WESTERN DIVISION OF FIJI

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ABSTRACT

Livestock husbandry is one of the branches of agriculture farming concerned with animals raised for milk, meat, eggs, fiber, or other products. It includes regular care, selective breeding and the raising of livestock. In developing countries such as Fiji, the livestock production sector is highly competitive, but it still has considerable gaps in current literature. This research fills the lacuna by investigating livestock rearers' economic behaviour and analyses its trend in Fiji's western division. Both primary and secondary data sources have been used to gather information. One hundred farmers from the villages of Nadi, Ba and Tavua districts were selected randomly. Data for eighty-two responses were received, which covered social and economic perspectives to analyse livestock rearers' involvement in diverse livelihood activities

in the understudied area. The collected data were analysed with simple statistical techniques. The research purports that majority of the farmers were involved in crops and vegetable farming followed by crop and livestock farming. The research findings indicate that with the increase in education level, the interest of the people in agriculture, particularly in livestock farming, has declined. Most of the young people in the age group of 20-30 years revealed unwillingness in livestock husbandry in addition to majority reared livestock for subsistence purposes. However, a trend of livestock rearing in the study area is increasing at a languid pace.

Introduction

Human population in 2050 is estimated to be 9.15 billion, with a range of 7.96–10.46 billion (UNPD, 2008). Most of the population increase is projected to occur in developing countries (FAO, 2010). Approximately one in nine people (2018: 821.6 million) suffer from hunger in the world or are undernourished (roughly 13 per cent) mostly in Low to Middle-Income Countries (LMICs), and the number is still growing (WHO, 2019). According to World Food Summit in 1996, food security exists when all people, at all times, have physical and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences to ensure an active and healthy life. The potentiality of livestock and poultry rearing in Bangladesh by smallholder farmers has been assessed in relation to the improvement in food security condition, and poverty alleviation; that suggests that growth in the family size led to decrease of food security condition whereas the rise in expenditure on food items shall enhance food security condition (Rahman et al., 2020).

Agricultural development (crops and livestock), biodiversity and aquatic species are under pressure due to climate change scenario in the Pacific. Livestock and wildlife populations can be adversely affected. Changes in water temperature and ocean acidification, on the other hand, may have an adverse impact on livestock ecosystem. The short-term improvements need to be handled by public awareness programmes, recognising weather conditions to plan for floods, reclaiming property, enhancing livestock breeding, wildlife sanctuaries, and inventing commercially viable water storage technology at a local level. However, the long-term strategies recommend the enforcement of international negotiations, international assistance, and joint initiatives (Bakare et al., 2020).

Xiaolong Feng et al., 2021, argues that adaptation to climate change is critical for herder households in China's pastoral areas, whose livelihoods would be deeply influenced by long-term climate change. Awareness of climate change and its effect on livestock output and grassland productivity should be transmitted to herder households by education and extension, particularly to households with large farms. Long-term temperature rises have a detrimental impact on livestock, whereas long-term rainfall changes have a favourable effect on net income for livestock. We have found that the effect

of climate change on livestock production varies between large and small farms; more importantly, the net income of livestock from large farms is more susceptible to annual temperature changes than that of small farms, which, in turn, is more prone to growing annual rainfall than that of large farms.

The effect of technical catch-up on livestock output on trade in livestock and grain products between countries in the Asia-Pacific area is evaluated. Tests are performed under the basis that production ratios in the Asia-Pacific zone converge. Projections of livestock production are produced and integrated into the updated GTAP model. The implications for regional and global exchange in livestock and grain products are being discussed (Rae, A. N., & Hertel, T. W., 2000).

Livestock is one of the essential providers of nutrients and tractions for growing crops in smallholder systems, particularly for vulnerable communities in the world. Its products contribute up to 33 per cent kilocalorie consumption of protein globally, but there are significant differences between developed and developing countries (Rosegrant, 2009). However, the production and consumption of livestock products are now mounting only slowly or stagnating, although at high levels in developing countries (World Bank, 2009). Moreover, it is one of the significant global financial resources in impoverished communities across the developing world. It plays an integral part in agricultural activity in the production of different food and non-food grain crops since long. Its practice is considered as a secondary source of income and provides an excellent opportunity for employment and income generation (Iqbal, 2010).

Resource-poor rural households used to keep several types of livestock in the world like cattle, goat, sheep, chicken, buffalo, camel etc. as domestic and an additional activity in the process of production of different foods since long (Khan & Iqbal, 2011). It is practised in the form of subsistence together with the commercial type of agriculture system. This sector employs at least 1.3 billion people globally and directly support the livelihoods of 600 million poor smallholder farmers in the developing world (Thornton et.al., 2006).

Globalisation and growing demand for animal food are playing a significant role in a rapid change in the livestock sector in the world (Robinson et.al., 2011). Livestock is a remarkable global asset with a value of at least \$1.4 trillion and occupied almost 30 per cent of the planet's ice-free terrestrial surface area in the world (Steinfeld et.al., 2006). It is considered as an investment and additional income for farmers and security during crop failure. One-third of global agricultural gross production value contributed by the livestock sector in 2013. It is the biggest user of land resources. In the same year, 2013, permanent meadow and pastures accounted for 26 per cent of the global land area, whereas 33-40 per cent of global arable land is used to grow feed crops (FAO, 2018). Eighty per cent of total agricultural land represents pastures and land together with

permanent meadows dedicated to the production of feed of the livestock (Down to Earth, 2016). The livestock market in the developing countries is more of indigenous in nature; it is essential to rely upon the locales domesticated animals' population. The livestock population has not demonstrated any worth referencing development during the last few years. Hence it stayed pretty much stale like the vast majority of the developing countries. Be that as it may, the market execution is still, of course (Alam, M.A., 2013).

The rearing of livestock helps farmers enhance their income and dietary intake (Hossain et al., 2021). For example, duck rearing plays a vital role in livestock rearing because it not just increases the income but also supports the quality of protein consumption. In normal circumstance, small landholding farmers cannot afford to purchase and consume from the market. The same could be applied primarily in many Pacific Islands, especially Fiji, where crop production is not guaranteed because of frequent natural disasters. The livestock species contribute to the food security, income security and cultural status of the rural community of the pacific islands (FAO, 2008).

Contribution of both men and women in livestock rearing has its own significance, Pandey et al (2020) conducted a random sampling of Indian women farmers from small and marginal families involved in livestock rearing and moots to recommend the "with the help of capacity building and developing appropriate literature related to improved animal rearing practices, the knowledge of farm women regarding improved animal rearing practices and their acceptability regarding selected technological options can be improved". This research does not qualify in Fiji's perspective. This nation does not have any social, cultural or religious taboos or restrictions for women or men to engage in small livestock farming (Cowley et al., 2019). Therefore, both gender participation in livestock rearing may vary in different societies.

Livestock farming is one of the components of a mixed farming system that has been a priority for decades. It is an integral part of the Pacific island's social and cultural systems and is prominent in many traditional ceremonies. It is one of the indispensable agricultural sectors for the countries of the Pacific. In Fiji, the agriculture sector plays a vital role in the economic development contributing at least 15 per cent to GDP, with 5 per cent coming from livestock production. The livestock sector has significant implications for employment creation, economic development and food security, and contributes positively to foreign exchange earnings in Fiji (SPC, 2011). The tropical cyclone is a regular annual phenomenon in Fiji, particularly between November to April. Recently, tropical cyclone Yasa hit and devastated parts of Fiji with a high-speed wind of about 350 kilometres per hour. In Fiji, animal rights groups encouraged residents not to forget

about their pets, stray animals, and livestock (The Animal Reader, 2020). There is a minimal shelter for the livestock in the production system; thus, the animals are potentially most at risk (Bell, J., & Taylor, M. 2015).

Objectives of the Study

Keeping in view the significance of livestock sector, the researchers have chosen the following objectives to conduct a study in Fiji's western division.

1. To investigate the economic behaviour of livestock rearers.
2. To ascertain the trend of livestock production in the leeward west side of Viti Levu.

The Study Area

Fiji consists of 18,376 km² of land and includes about 330 islands, of which about 100 are inhabited. The largest island and population centre is Viti Levu, an area of 10,388 km² (Figure 1). Viti Levu is characterised by high mountains, dry on the leeward west side and wet on the windward east side. Watters (1966) stated livestock farming in the wetter parts of Viti Levu of Fiji is considered primarily with dairy farming than dryer parts. However, the dryer parts, i.e., western division also have much potential for livestock rearing because most parts of plain areas of Fiji are lying in this western division, which favours the farmers for agriculture production. Therefore, this research is conducted mainly in three districts, i.e., Ba, Tavua and Nadi of the western division of Fiji, which are relatively drier zones. These zones are subject to significant seasonal and inter-annual climatic variation (Mataki, M., et.al, 2006).

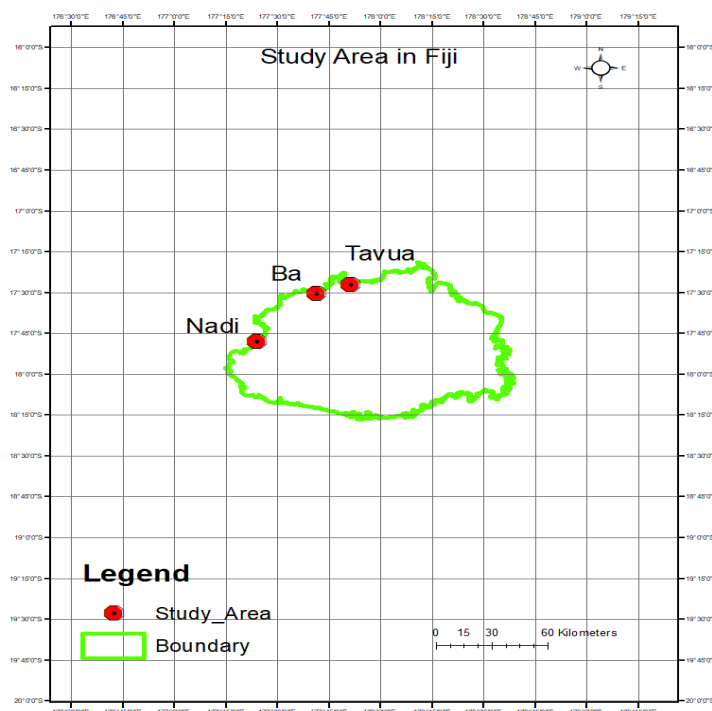


Figure 1: The Study Area

Materials and Methods

The study has been conducted during the year (2018-2019). One hundred farmers from 14 villages (25% of 55 villages of all three districts Nadi, Ba and Rakiraki) have been selected for the study. Selection of the villages was made according to road accessibility from the main road to the sampled villages. Remote interior villages were excluded due to ethical and other security reasons. Farmers from the sampled villages were randomly selected and consulted for the survey. Farmers were enquired about their landholdings, economic activities with their education, age groups, types and modes of farming and livestock rearing activities. The questions were responded differently in numbers by the farmers. Collected data were tabulated, processed and analysed with simple statistical techniques.

Results and Discussion

Farmers have occupied the land in different proportion in the study area. 87.78 per cent farmers revealed their landholdings, which range from 29.26 per cent with more than 6 acres to 4.87 per cent with less than one acre of land. 29.26 per cent acquired more than 6 acres of land, 19.51 per cent, 3-4 acres of land and 18.29 per cent acquired 1-2 acres of land in the study area of Ba, Tavua and Nadi. However, the share of landholding in these three districts varies with the highest percentage of 35 per cent (1-2 acres) in Tavua, 37.03 per cent and 40 per cent (>6 acres) in Ba and Nadi respectively.

Landholdings (in acres)	Tavua	Ba	Nadi	Total Landholdings
<1 (Marginal)	3 (15)	0	1 (4)	4 (4.87)
1-2 (Very Small)	7 (35)	4 (14.81)	4 (16)	15 (18.29)
3-4 (Small)	4 (20)	5 (18.51)	7 (28)	16 (19.51)
5-6 (Medium)	2 (10)	8 (29.62)	3 (12)	13 (15.85)
>6 (Big)	4 (20)	10 (37.03)	10 (40)	24 (29.26)
Total response	20 (100)	27 (100)	25 (100)	72 (87.78)
No response	1	7	2	10
Total No. of Farmers	21	34	27	82

Source: Field Survey, 2018, Figures in parenthesis is the percentage response of landholders.

Moreover, the smallest fractions of landholders come under the category of 5-6 acres in Tavua and less than one acre in Ba and Nadi (Table-1). It is unveiled that most of the farmers have inherited land or leased from *i-taukei* (indigenous people of Fiji) rather than purchased. Another way of acquiring

the land by farmers was either renting the land or working as a part-timer on a temporary share of the product produced.

The active working population in the study area lies between 31- 40 to 51-60 years of age groups. These groups of ages actively do most of the livelihood activities depending on their level of interest, qualification and market demand. Farmer's peak age among all the economic activities except non-farm activity lies between 41-50 years. Farmers are engaged in various economic activities such as vegetable farming and crop production, livestock and crop production, wage employee, non-farm activity etc.

Table 2. Preferences for economic activities by different age group of the farmers (in %)

Age Group of the Farmers	Preferences for Economic activities				Frequency
	Vegetable Farming and Crop Production	Livestock and crop production	Wage employee	Non-farm activity.	
15-20	0 (0)	0 (0)	0 (0)	2 (2.43)	2 (2.43)
21-30	0 (0)	0 (0)	0 (0)	4 (4.86)	4 (4.86)
31-40	5 (6.1)	0 (0)	0 (0)	10 (12.2)	15 (18.3)
41-50	14 (17.07)	14 (17.08)	3 (3.66)	1 (1.22)	32 (39.03)
51-60	10 (12.2)	10 (12.2)	2 (2.44)	0 (0)	22 (26.84)
>60	7 (8.54)	0 (0)	0 (0)	0 (0)	7 (8.54)
Total	36 (43.91)	24 (29.28)	5 (6.10)	17 (20.71)	82 (100)

Source: Field Survey, 2018

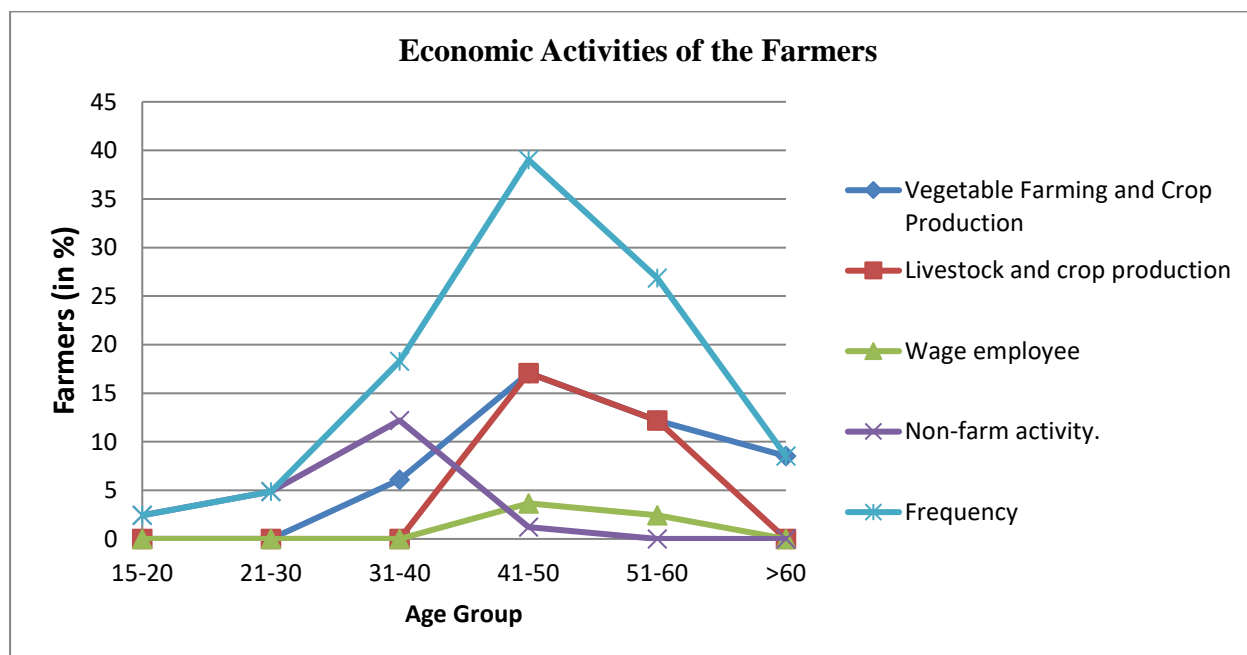


Figure 2

However, preferences of activities among the farmers vary in different age groups. Non-farm activities are preferred by early age groups (15-20 and 21-

30 years) than the vegetable farming and crop production, livestock and crop production and wage employee. The age group of 31-40 years give the preference to vegetable farming and crop production. However, the age group above 41 years is concerned about almost all the activities mentioned above. This trend shows unwillingness towards livestock and crop production and wage employee on the farm by young generations, i.e. below 30 years of age. This trend is attributed to modernisation, education, the standard of living, migration, motivation towards white-collar jobs, health issues, government policies, land policies, loss and profit etc.

As per the farmer's education level, the highest percentage involved in various economic activities having either primary school education or no formal education (32.93 per cent). It is followed by form four (10th class, 23.17 per cent) and form 6 level education (12th class, 18.29 per cent) respectively. The highest percentage preferred by primary level educated people contributed to mainly two professions like vegetable farming and crop production (18.29 per cent) and livestock farming and crop production (14.63 per cent). However, they did not show any interest in wage employee or non-farm activities due to their comfort level of being less educated or uneducated.

Education Status	Vegetable Farming and crop production	Livestock and crop production	Wage employee	Non-farm activity	Total
Primary School	18.29	14.63	0.00	0.00	32.93
Form 4	9.76	8.54	2.44	2.44	23.17
Form 6	8.54	3.66	2.44	3.66	18.29
Form 7	2.44	2.44	0.00	7.32	12.20
Diploma/Degree	0.00	0.00	0.00	13.41	13.41
TOTAL	39.02	29.27	4.88	26.83	100.00

Source: Field Survey, 2018.

Nevertheless, involvement in the highest percentages of non-farm activities is a diploma and degree holders (13.41) and form seven-level (class 13, sometimes called a bridging course, 7.32 per cent) educated farmers; however, they are less in numbers. Similarly, form four (tenth Class) pass farmers showed interest more or less in all types of economic activities ranging from 8.4 per cent in vegetable farming and crop production, 3.66 per cent in livestock and crop production and non-farm activity as well as 2.4 per cent in wage employee.

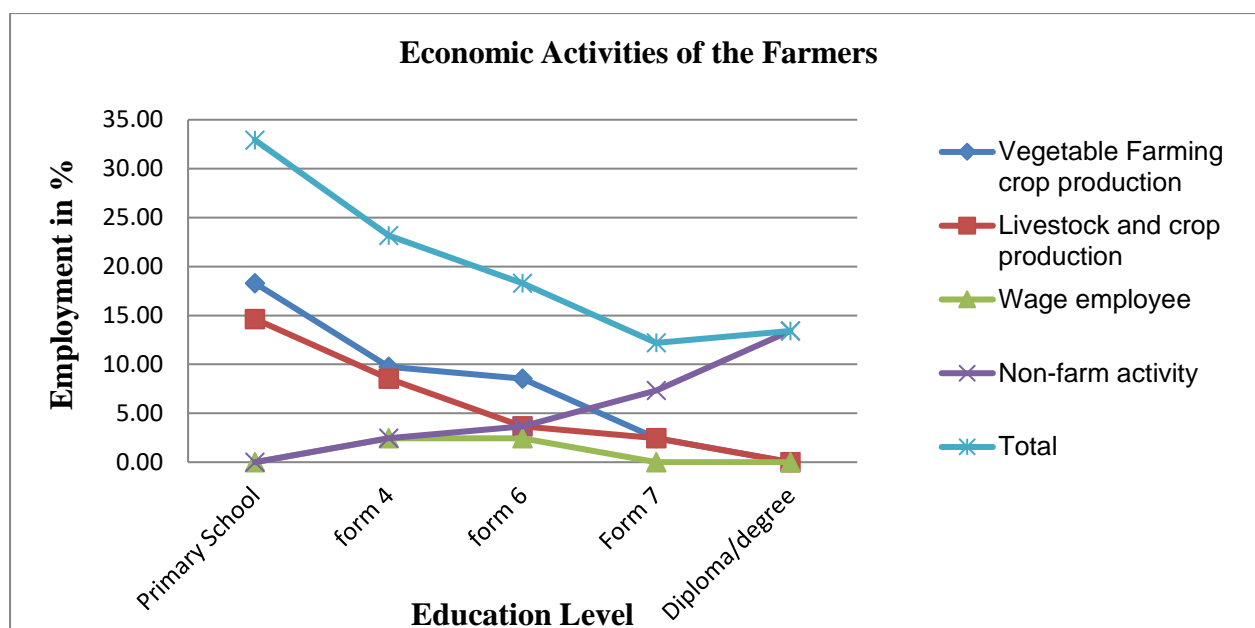


Figure 3

Easy availability of organic fertiliser (Mill mud) from the sugar mill enhances the productivity of the land in the study area, which encourages the farmers for agriculture farming. Crop and livestock farming ranks the second position due to topographic features, i.e., those sloppy areas which are not used for vegetable production and the areas which are either barren or unused for vegetable production is used for small livestock rearing such as goat and sheep grazing. Generally, the marginal and small farmers have one to two cows due to partial land, semi-permanent cages, traditional fenced management, family-centred labour, inadequate money and assets to maintain dairy cows.

Table 3 and figure 3 depict the reverse trend of education and farming activities. With the increase in education level, farmers' involvement in vegetable farming and crop production and livestock farming and crop production shrinkages. Consequently, it is evident from the results that there is an inverse relationship between education and livestock rearing in the study area.

Table 4 indicates that the farmers rear various livestock viz. cattle (both local and hybrid dairy cattle) goat, sheep, chicken, pigs, horse etc. in the combination of two/three or more livestock together. The livestock farming by the farmers with priorities comprises of a combination of cattle, goat and sheep (29.27 per cent) followed by a combination of cattle +goat+ sheep +chicken (21.95 per cent) and combine cattle + goat (20.73 per cent). All regions prefer cattle and goat with or without the combination of other animals such as Tavua mark the highest by 30 per cent in Cattle + Goat, Ba 41.18 per cent in Cattle + Goat + Sheep and Nadi 28.57 per cent in Cattle + Goat+ Sheep + chicken.

These priorities of livestock rearing are based on farmers' income, available time to look after the animals, number of working hands in family purposes

of rearing animals (commercial and subsistence) and the number and types of animals etc. The research reveals that farmers always prefer mixed subsistence livestock farming for their sustenance and survival. They usually rear it either for milk and meat consumption, marketing, transportation or for use in the time of any emergency.

Livestock type	Tavua	Ba	Nadi	Total
Cattle + Goat/Sheep + Chicken + Pigs	1 (5.00)	2 (5.88)	2 (7.14)	5 (6.10)
Cattle + Goat+ Sheep + chicken	5 (20.00)	6 (17.65)	7 (28.57)	18 (21.95)
Cattle + Goat+ Sheep	4 (20.00)	14 (41.18)	6 (21.43)	24 (29.27)
Cattle + Goat	6 (30.00)	5 (14.71)	6 (21.43)	17 (20.73)
Horse	4 (20.00)	5 (14.71)	4 (14.29)	13 (15.85)
Chicken farming only	1 (5.00)	2 (5.88)	2 (7.14)	5 (6.10)
Total	21 (100)	34 (100)	27 (100)	82 (100)

Source: Field Survey, 2018.

The study also revealed that only the big farmers are mostly involved in commercial/industrial dairy production in the study area. The traditional and commercial form of livestock husbandry has been practised in Fiji since long for milk and meat production but at a small scale, with little production to meet local demands. For example, milk consumption in Fiji is approximately 74,430,000 liters annually, but only 16 per cent of this demand is met by local production. However, the consumption and therefore imports of livestock products from the dairy sector, including powdered milk, ice cream, cheese, yoghurt, and meat, leather, and fibre, are increased steadily right across the region (Epeli, 2013).

Livestock rearing indicated an increasing trend since 2014 except during 2016-17 when there is a significant drop among almost all livestock rearing types. The main reason for this huge drop is the Tropical Cyclone Winston (Category 5) which caused a lot of damages to the livestock. Many farmers lost their interest and confidence because the livestock sector was severely impacted, and they needed to start all over again.

Year/Livestock	2018	2017	2016	2015	(2014)
Cattle (Non-dairy)	169	70	170	107	67
Cattle dairy	351	255	183	136	95
Goat	442	291	245	172	116
Sheep	250	179	153	88	60
Chicken	1020	647	784	366	277
Pigs	124	51	27	22	29

Horse	279	45	48	33	35
Duck	534	473	420	216	166

Source: Field Survey, 2018.

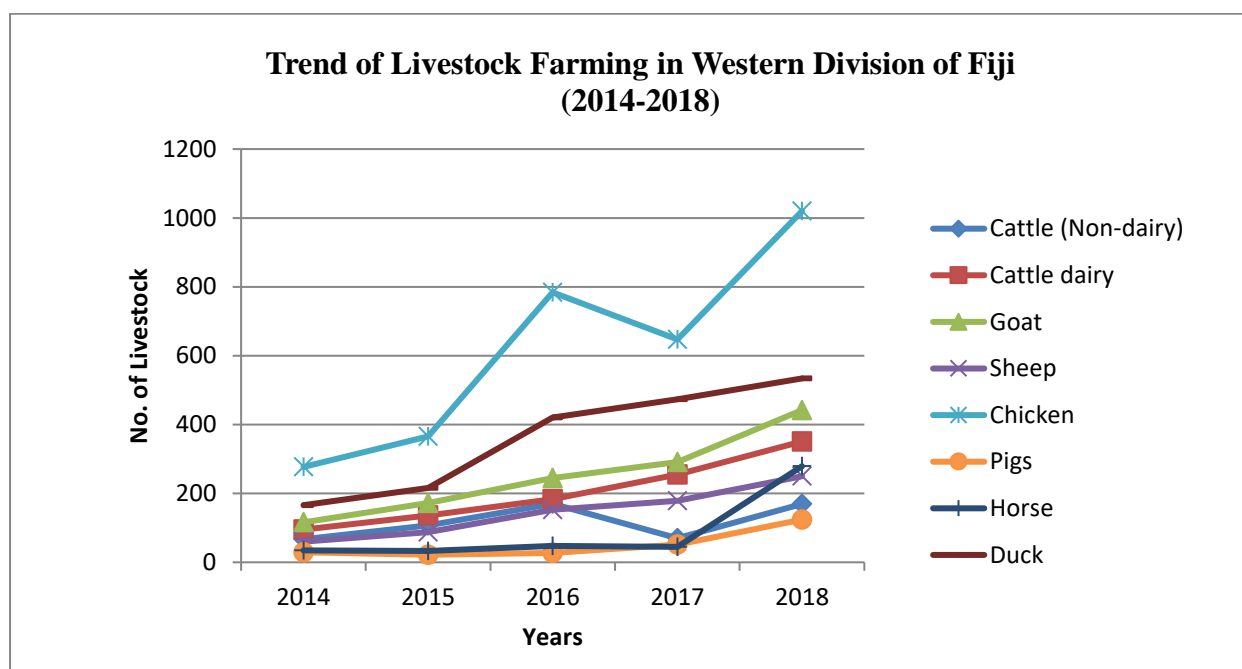


Figure 4

The farmers focused on rebuilding their homes rather than on livestock sides due to financial constraints and appropriate management problem for the livestock. Comparative drought in the western division could be the other factors of diminishing farmers' interests in livestock rearing.

Notwithstanding, there is a significant increase in the number of livestock during 2017-2018 with variations among the trends of different animals for the last five years in the study area (Table 5, Figure-4). Fiji is a multicultural and multi-religious nation where festivals of different religions are celebrated, which have a direct impact on the rearing of livestock for income generation and domestic consumption. The increase in the number of livestock unanimously attributed to the consciousness towards the income generation during incoming series of festivals like Eiduzzuha (Bakraiid), Diwali and Christmas and other ceremonies.

Because of the easy backyard rearing, low cost, and high consumption, chicken and duck rearing is always the top choice of the people. Essentially, these animals reared on subsistence farming system for their use or survival purposes. Goat, dairy cattle and sheep ranked third, fourth and fifth positions, and used as per their requirement such as self-consumption on ceremonies, marketing for income generation etc. (Table 5, Figure 4). Therefore, livestock rearers attempt to buy and feed the animals from different income sources such as crop and vegetable farming, sugarcane farming, wages, savings, livestock sales, gift etc. Sometimes cane top is used for the livestock feeding and even the cane in the dry season is used for the livestock.

However, some problems faced by the rearers are theft, the incidence of drought, lack of extension services, late arrival of doctors, diseases, low price of the milk etc. The solutions may include the awareness among the farmers, education among the community, the thief should be disciplined (arrested), timely availability of doctors and extension services for injection and medication etc.

Conclusion

Most of the farmers in the study area are having more than 6 acres of land followed by 3-4 and 1-2 acres of landholders respectively. The results of the study add the growing body of evidence that younger generations and educated people are not willing to be involved in the farming activity because of its low profile and time-consuming nature, the desire of white collar jobs, perishable nature of this activity, hard work etc. They are more concerned about working in the industries due to the competitive wage and more security than dairy farms since industrial expansion and economic structure changes.

Farmer's main occupation is crop and vegetable farming followed by crop and livestock farming (29.07 per cent) and livestock farming alone (14.89 per cent) in the study area. The farmers rear various types of livestock viz. dairy cattle, goat, sheep, chicken, pigs, horse etc. or the combination of two/three livestock together. The herd with the priority of combination of cattle, goat and sheep followed by the combination of Cattle + Goat+ Sheep + Chicken + Pigs and dairy livestock only which is on subsistence basis rather than commercial purposes. The trends in livestock production show a sinusoidal increase with a sharp drop in 2016 and 2017. The increase in the number of livestock after 2017 attributes to the awareness towards the income generation.

Nonetheless, livestock rearers are getting benefit and using this activity both for subsistence and commercial purposes. This activity impacts a lot on the life of livestock dwellers. Sometimes farmers use livestock as an ATM (automated teller machine) at the time of emergency. Farmers do mixed farming even at subsistence level, but they must be encouraged to do it at a commercial level. They must be appreciated to learn about the government schemes which would help a lot in livestock rearing at the commercial level. Fiji's primary challenge is to produce the requirements of milk, meat, and other livestock products locally while providing economic opportunities, greater self-reliance, and enhanced food security. This study is a valuable contribution to the field as it recommends the said challenges could be fulfilled from the domestic livestock if proper attention will be given, and of course, educated, and skilled people should be involved in these activities at a mass level. Co-operative livestock farming can be promoted with the help of professional and experienced human resources at a local, regional, and national level to improve the country's economic status.

Despite making several novel observations based on the micro-level study, a significant limitation is that the surveys are carried out only in three districts of western Viti Levu. The study's limitation must be considered in future studies by expanding the horizon of the research area in Fiji and similar regions in the Pacific Islands.

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