EFFECT OF URBANIZATION ON LIVELIHOOD OF FARMERS IN DAIRY AND CROP PRODUCTION SYSTEM IN THE PERI-URBAN AREA OF BENGALURU

THESIS SUBMITTED TO THE
ICAR-NATIONAL DAIRY RESEARCH INSTITUTE, KARNAL
(DEEMED UNIVERSITY)
IN PARTIAL FULFILMENT OF THE REQUIREMENTS
FOR THE AWARD OF THE DEGREE OF

MASTER OF SCIENCE
IN
AGRICULTURAL EXTENSION EDUCATION
BY

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B.Sc. Agriculture

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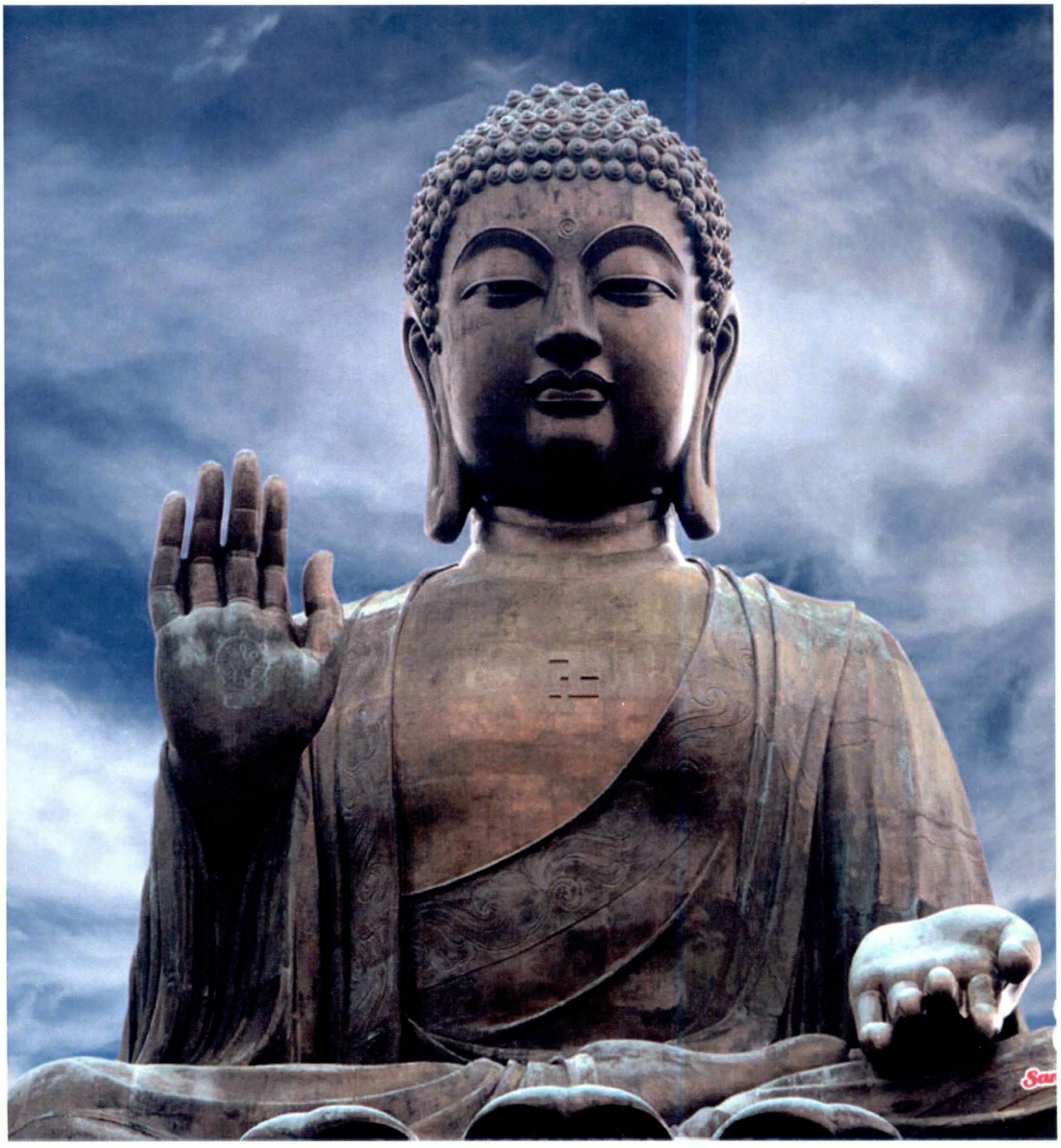

Dedicated
to My
Beloved Parents,
Respected Guide
&
Sweet Sister Sharanya Ram

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This is to certify that the thesis entitled, **"Effect of Urbanization on Livelihood of Farmers in Dairy and Crop Production System in the Peri-urban area of Bengaluru"** submitted by **Mr. RAVI K N** towards the partial fulfilment of the award of the degree of **MASTER OF SCIENCE IN AGRICULTURAL EXTENSION EDUCATION** of the **ICAR-National Dairy Research Institute (Deemed University)**, Karnal, Haryana, India, is a bonafide research work carried out by him under my supervision, and no part of the thesis has been submitted for any other degree or diploma.

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Dated: 4th July 2015

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Date: **(Ravi K N)**

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LIST OF ABBREVATIONS

CB	:	Cross breed
CBSE	:	Central Board for Secondary Education
DES	:	Department of Economics and Statistics
et. al.	:	and others
FES	:	Family Education Status
FGD	:	Focus Group Discussion
FLM	:	Family Labour Migration
GOI	:	Government of India
Kg	:	Kilogram
IT	:	Information Technology
NDDB	:	National Dairy Development Board
OBC	:	Other Backward Class
PRA	:	Participatory Rural Appraisal
PS	:	Purposive Sampling
RBQ	:	Rank Based Quotient
RS	:	Random Sampling
SC	:	Scheduled Caste
ST	:	Scheduled Tribe
SWOT	:	Strength, Weakness, Opportunity and Threat
TV	:	Television
UPA	:	Urban and Peri-Urban Agriculture

ABSTRACT

Indiaôs agriculture policies and programmes have given more thrust in rural areas to achieve self sufficiency in food production. But for ensuring future food security to all, more focus needs to be given to urban and peri-urban areas for farm production as per market demand. The positive aspect needs to be harnessed on the basis of priorities and preferences of farmers in crop and dairy farming. This requires understanding the challenges, trends and approaches for producing food in accordance with natural and national laws & regulations. Keeping these in view, the present study was conducted in peri-urban area of Bengaluru to understand the change in livelihood pattern of the farmers as well as the effect of urbanization on farm land and change in dairy and crop production system in peri-urban area. The present study was conducted in purposively selected in peri-urban area of Bengaluru in Karnataka state. Four blocks around the city periphery were selected purposively due to its peri-urban characteristics. Two villages were randomly selected from each block. From each village 20 respondents were selected randomly. Hence, a total of 160 respondents constituted the sample size and data collection was done through PRA tools and semi-structured interview schedule. Post stratification of respondents was made into sold (n=93) and unsold (n=67) categories based on their farm land sold. Majority of sold (41.9%) and unsold category (41.8%) belonged to middle age group (36-50 years). Schedule caste and schedule tribes in sold category were more (24.7%) as compared to unsold category (11.9%). More graduate and above educated (9.7%) sold their land as compared to unsold (4.5%). Around 46.3 per cent respondents belonged to medium category (5-8 family members) in case of both sold and unsold category. More than half of respondents (55.9%) in sold category belonged to marginal farmers as compared to unsold category (37.3%). Sold category had high (>2) family education status (26.9%) versus unsold category (7.5%). Nearly three-fourth (71.00%) of the sold category farmers had disposed their land (50.5 ha) to real estate firms followed by one-fourth (21.50%) to Government and 7.50 per cent to neighbours. In case of money obtained by selling the land, majority (86.00 %) of the farmers utilised the money for house construction. About 55.6 per cent farmers had decided not to sell the land in the near future. Household livelihood pattern of respondents revealed that crop production (5%), crop+dairy (26.3%), crop+allied agriculture activity (2.5%), crop+dairy+allied agriculture activity (10%), crop+allied non-agriculture activity (11.3%), crop+dairy+allied non-agriculture activity (20.6%), dairy+ non-allied activity (4.4%), allied agriculture activity (5%), non-allied agriculture activity (15%) were the major combination of livelihood pattern of respondents. Since the year 2000 to 2015, small scale business was further added as a livelihood source of income by sold (17.20%) and unsold farmers (14.90%). The respondents of sold category who left dairy farming and crop production were 21.50 per cent and 17.20 per cent while it was 1.50 per cent and 7.45 per cent less among unsold respondents respectively. Multinomial logit model revealed that ôbetaô coefficient for family labour migration was positively significant in all the three categories i.e. non-agricultural activities (4.82), agriculture and non-allied activities (3.46) and agriculture and allied activities (3.35) in comparison to the base category i.e. crop+dairy activity. Total income was found to be positively significant in the case of non-agricultural activities as well as agriculture and non-allied activities. Literates preferred non-agricultural activities by 3.48 units higher than the illiterates. Decrease in herd size shows that the relative probability of a respondent to get engaged in a non-agricultural activity is more than the agriculture and allied activities in comparison to the crop+dairy activities. From 1997 to 2012, the total livestock population showed negative growth rate. The area under cultivation of cereals, pulses, oilseeds showed drastic reduction from 2001 to 2014. While commercial flower crops showed positive trend. Additional source of income from peri-urban dairy and high demand and price for milk in peri urban areas were reported as most advantageous by the farmers. More disease incidence reported as serious constraint. Better accesses to the educational institutes, diversification in livelihood pattern were positive effect of urbanisation. Negative effects like land loss, unethical land purchases and land transactions were noticed.

बेंगलुरू के बाह्य शहरी क्षेत्र में डेयरी तथा फसल उत्पादन तंत्र में किसानों की आजीविका पर शहरीकरण का प्रभाव

सारांश

भारत की कृषि नीतियों और कार्यक्रमों में, खाद्य उत्पादन में निर्भरता प्राप्त करने के लिये, ग्रामीण क्षेत्रों पर अधिक जोर दिया जा रहा है। परन्तु सभी के लिए खाद्य सुरक्षा सुनिश्चित करने के लिए बाजार की मांग के अनुसार कृषि उत्पादन के लिए शहरी और बाह्य शहरी क्षेत्रों पर ध्यान देने की आवश्यकता है। इसका सकारात्मक पहलू तभी प्राप्त किया जा सकता है जब हम किसानों के कृषि और डेयरी फार्मिंग में प्राथमिकता दें। इसके लिए यह आवश्यक है कि हम चुनौतियों को समझें तथा प्राकृतिक और राष्ट्रीय नियमों के अनुसार खाद्य उत्पादन का दृष्टिकोण अपनायें। इन सब बातों को ध्यान में रखते हुए, वर्तमान अध्ययन, किसानों की आजीविका में मौजूदा परिवर्तन, कृषि और भूमि पर शहरीकरण के प्रभाव को समझने, तथा डेरी और खाद्य उत्पादन के व्यवस्था पर शहरीकरण का प्रभाव जानने के लिए बेंगलुरू में किया गया। वर्तमान अध्ययन कर्नाटका राज्य में उद्देश्यात्मक रूप से चयनित किये हुए बेंगलूरू के बाहा क्षेत्रों में किया गया। बाहा शहरी विशेषताओं के कारण शहर की परिधि के चारों ओर से चार ब्लाकों को चयनित किया गया। बेतरतीव्र देश से दो गांवों को प्रत्येक ब्लाक से चयनित किया गया। प्रत्येक गांव से 20 उत्तरदाताओं को बेतरतीव्र ढंग से चयनित किया गया। इस प्रकार कुल 160 उत्तर दाताओं को चयनित किया और डाटा का संग्रह पी.आर.ए. तथा अर्द्धसंचरित साक्षात्कार सूची के माध्यम से किया गया। विक्रय (n=93) और अविक्रय (n=67) दो श्रेणियों (कृषि भूमि के विक्रय के आधार पर) के आधार पर उत्तरदाताओं का वर्गीकरण किया तथा विक्रय वर्ग को पूर्ण विक्रय आंशिक विक्रय वर्ग के रूप में विभाजित किया। अधिकांश विक्रय (41.9%) तथा अविक्रय (41.8%) वर्ग के किसान मध्यम आयु वर्ग (36-50 वर्ष) के थे। अविक्रय वर्ग (11.9%) की तुलना में अधिकांश, अनुसूचित जाति तथा अनुसूचित जनजाति विक्रय वर्ग (24.7%) से सम्बन्धित थे। स्नातक और उच्च शिक्षित लोग (9.7), अविक्रय (4.5) की तुलना में अधिक भूमि बेच दिया। विक्रय और अविक्रय दोनो वर्ग से, लगभग 46.3 प्रतिशत उत्तरदाता मध्यम वर्ग (5–8 सदस्य) से सम्बधित थे। अविक्रय वर्ग (37.3%) के तुलना में विक्रय वर्ग (55.9%) के आधे से अधिक उत्तरदाता सीमान्त किसान थे। विक्रय वर्ग की पारिवारिक शैक्षिणिक स्थिति (26.9%) अविक्रय वर्ग (7.5%) से उच्च थी। विक्रय वर्ग के तीन चौथाई किसान (71%) अपनी भूमि का (50.5 ha) रियल स्टेट, एक चौथाई (21.5%) सरकार को और 7.5 प्रतिशत किसान अपने पड़ोसियों को बेचा था। अधिकांश किसान (86%) अपनी भूमि को बेचने से प्राप्त धन को घर बनाने में उपयोग किया था। लगभग 55.6 प्रतिशत किसानों ने अपनी जमीन को भविष्य में न बेचने का निश्चय किया था। उत्तरदाताओं का घरेलू आजीविका व्यवस्था निम्न रूप से थी–फसल उत्पादन (5%), फसल+डेरी (26.3%), फसल+सम्बद्व कृषि गतिविधि (2.5%), फसल+डेरी+सम्बद्व कृषि गतिविधि (10%), फसल+सम्बद्व गैर कृषि गतिविधि (11.3%), फसल+डेरी+सम्बध गैर कृषि गतिविधि (20-6%), डेरी+सम्बद्व गैर कृषि गतिविधि (4.4%), सम्बद्व कृषि गतिविधि (5%), सम्बद्व गैर कृषि गतिविधि (15%),

ये सब मुख्य आजीविका व्यवस्था के संयोजन थे। वर्ष 2000 से 2015 तक लघु उद्योग विक्रय (17.2%) तथा अविक्रय (14.90%) वर्ग के आजीविक के लिए आय के मुख्य साधन थे। विक्रय वर्ग के उत्तरदाता जो डेरी और फसल उत्पादन हेतु दिये थे, क्रमशः 21.5%, तथा 17.2% थे जबकि अविक्रय वर्ग में यह 1.5 प्रतिशत तथा 7.45 प्रतिशत थे। मल्टिनोरियल लॉजीट मॉडल यह संकेत करता है कि परिवार श्रम पलयान के लिए 'बीटा' गृंणांतु सभी तीन श्रेणियों में सकारात्मक रूप से महत्वपूर्ण था, अर्थात गैर कृषि गतिविधियों (4.82%), कृषि और असम्बहद्ध गतिविधियों (3.55%), आधार वर्ग अर्थात फसल+डेरी के तुलना में। कुल आय गैर कृषि गतिविधियों में सकारात्मक रूप से महत्वपूर्ण था। साक्षरों ने निरक्षरों के तुलना में 3.48 यूनिट द्वारा गैर कृषि गतिविधियों के प्राथमिकता दी। पशुओं की संख्या में कमी होने से यह पता चलता है कि उत्तरदाता गैर कृषि कार्यो में अधिक संलग्न है। वर्ष 1997 से 2012 तक, कुल पशुधन जन संख्या में नकारात्मक वृद्वि दर देखी गई। दलहन, तिलहन तथा अनाज की खेती में 2001 से 2014 के बीच भारी कमी देखी गयी। जबकि वाणिज्यिक फसलों में सकारात्मक रूझान दिखा। दूध की मांग तथा उच्च कीमत एक अतिरिक्त आय के स्त्रोत के रूप में बह्म शहरी क्षेत्र में किसानो के लिए सबसे लाभदायक साबित हुआ। अधिक रोगों का आक्रमण एक बहुत चितन्नीय समस्या दर्ज की गयी। शैक्षिणिक संस्थानों तक बेहतर पहुँच, आजीविका व्यवस्था में विविधीकरण शहरीकरण के सकारात्मक प्रभाव थे एवं भूमिहीन अनैतिक भूमि खरीद और भूमि का लेन देन, ये सब नकारात्मक प्रभाव थे।

CHAPTER – 1

INTRODUCTION

INTRODUCTION

URBANIZATION PROCESS

Urbanization is a dynamic set of process, responding to changing values and perceptions of the intrinsic characteristics of rural versus urban areas. At the macro level urbanization is defined as the increase in concentration of population in urban areas both relatively and absolutely (Fazal, 2000). At the same time urbanization is also referred as the increasing share of a nationôs population living in urban areas. Often, urbanization is the result of net rural to urban migration. The level of urbanization is the share itself, and the rate of urbanization is the rates at which that share are changing (Satterthwaite *et al*., 2010). Demographic and economic expansion of cities, through processes such as migration and industrialization, tend to be accompanied by spatial expansion, resulting in encroachments by cities upon adjacent peri-urban areas (Lintelo *et al.*, 2001). At the same time, areas that were earlier distant from the city and rural in character will subsequently start falling within the cities reach. Typically, increased interaction with and access to the city economy in terms of capital, labour (public and private), goods and services will subsequently trigger the transformation of the rural to peri-urban areas. The rural - peri-urban - urban continuum itself is thus dynamic in nature and the changes will be more marked around cities that are rapidly urbanizing or growing both economically and spatially, as compared to slower-growing or stagnant urban cores.

URBANIZATION IN INDIA

For the first time since independence, the absolute increase in population in India is more in urban areas than in rural areas. The Rural ï Urban population distribution is 68.84 per cent and 31.16 per cent, respectively and the level of urbanization increased from 27.81 per cent in 2001 census to 31.16 per cent in 2011 census. The proportion of rural population declined from 72.19 per cent to 68.84 per cent. This increase in the number of urban areas is an indicator for the extent of decrease in the land for cultivation year after year. By 2050, India with about 1.7 billion people will be the most populous country in the world (Census

of India, 2011). Nearly 1 billion will be urbanized and the largest share will be of the rural migrants. The fast changing dietary habits, increasing income and rapid urbanization due to the demographic and economic expansion of cities through migration and industrialization, will further proportionately accelerate the peri-urban population and the demand for the higher quantity of quality milk. This is the present scenario of urbanization in India and the scenario in the Karnataka state is not different from the country. The level of urbanization in Karnataka has increased by 4.58 per cent, from 33.99 per cent in 2001 census to 38.57 per cent in 2011, while the level of rural population declined from 66.01 per cent to 61.43 per cent. This is the result of a situation where economic activity and job creation become increasingly urban-focused. Out of the 6.11 crore population in the state, 3.75 crore people are residing in rural areas and 2.35 crore in urban areas (The Hindu, 2011). As complimentary to above change Prof. M S Swaminathan, (2001) has said that increasing urbanization is one of the biggest challenge that India have to tackle immediately if the agricultural sector wishes to continue in its growth path.

URBANIZATION AND DAIRYING

India has the credit of being the largest producer as well as the biggest consumer of milk in the world. Dairying has a prominent role in the upliftment of rural farm families. Thus, being a vital source of income and employment for these farmers, dairy farming helps to combat poverty and favours income distribution, in the process of assuring a balanced development of rural economy (Kumar *et al*., 2011). It also has the worldôs largest dairy herd (comprised of cows and buffalos). In 2010-11, livestock generated output worth INR 2,075 billion (at 2004-05 prices) which comprised 4 per cent of the GDP and 26 per cent of the agricultural GDP. Indiaôs milk production accounts for 16 per cent of total global output (NDDB, 2014). Karnataka has 11th rank in overall milk production among the Indian states and second largest milk producer in the cooperative sector after Gujarat (The Hindu, 2013). Peri-urban dairy farming expands the nutritional and the economic base of the peri-urban areas through production, supply and marketing of milk and milk products, which result in the increase in the entrepreneurial activities and creation of job opportunities. It leads to better health and nutrition, increased income and employment

especially of women, food security within household and commonly social life as a whole for the livelihood of the peri-urban community. Milch animals in the peripheral areas of large cities are reared to supply the milk to the urban areas and the cities, thereby generate employment and income to peri-urban farmers. The increasing trend in milk consumption by urban dwellers favoured more number of peri-urban dairy farmers around cities and towns (Staal and Shapiro, 1996).

Dairy sector is one of the important segments providing food security to the millions of people living in the rural, urban and peri-urban areas. Apart from the rural areas, the peri-urban livestock farming is also common in Indian conditions and this comprises mostly the dairy animals. Peri-urban is an area or a village or a habitation located in the perimeter of the urban areas having a partial or complete influence of urbanization (Puspha, 2006). Public policies have focused strongly on dairy farming in the rural areas. However the role of peri-urban dairy farming as a major source of milk, a means of improving food security and enhancing the livelihood of poor producers.

URBANIZATION AND CROP FARMING

United Nations (World urbanization prospects, 2014) predicted that Indiaôs population will be 1.7 billion people by 2050, but it is critical to know where additional people will be and what they will eat. An additional 500 million (0.5 billion) people has huge implications for additional food need, but it can also result in the huge loss of agricultural land to urbanization and per capita availability of agriculture land is quite low (0.3 hectare per farmer) and declining over time, also there is wide geographic variation in crop and livestock productivity, even across regions that experience similar climates. The difference between realized productivity and the best that can be achieved using current genetic material and available technologies and management is termed the ñyield gapò. The best yields that can be obtained locally depend on the capacity of farmers to access and use, among other things, seeds, water, nutrients, pest management, soils, biodiversity, and knowledge (Godfray *et al.,* 2010). Besides, in the land use pattern, another area of serious concern is the fall in per capita availability of cereal and food production in India over the years. The per capita

availability of food has declined from 186.2 Kg per annum in 1991 to 167.4 Kg per annum in 2010. The production of food grains has increased over the years albeit it lagged behind the population growth.

EFFECT OF POLICIES ON URBANIZATION AND AGRICULTURE

India's agricultural policies have focused strongly on rural areas, aiming to achieve self-sufficiency in food production and to reduce rural poverty. Accordingly, urban food needs are expected, explicitly or implicitly, to be fulfilled by production in rural areas (Bakker *et al*., 2000). With the emphasis on rural agriculture, the positive contribution that production closer to the cities can make as hardly been acknowledged. Much of the evidence to data has been gathered from African, Latin American, Caribbean and some Asian and Eastern European countries. The Indian sub-continent has been underrepresented, reflecting a neglect of this issue by the international and national research communities. (Lintelo *et al.,* 2001*).*

Indeed, in India, government policies, scientific research communities and non-governmental organizations (NGOs) have shown little recognition of peri-urban areas in agriculture and dairy (Lintelo *et al.,* 2001*)*. The real estate growth and the continued demand for infrastructure development in the periphery of the urban areas make greater impact on the livelihood as well as priorities and preferences in crop and dairy farming. Farming in the peri-urban areas in the coming days is likely to pose many challenges which need to be properly visualized for the perspective planning.

In developing nations little attention has been paid to food production in peri-urban areas; nevertheless, agricultural activity is constantly increasing in small and medium sized cities due to migration of rural population and increasing demand for healthy food (Nahed-Toral *et al.*, 2011). To increase the potential of peri-urban dairy production and to meet the growing demand of milk and milk products in the peri-urban areas, empirical evidences on functioning mechanisms are to be documented from peri-urban dairy and crop farming systems. Also for the appropriate technological interventions and extension approaches for augmenting the peri-urban dairy and crop production, understanding the farmerôs current working conditions is a pre-requisite. To

maximise the production and thereby profit, identifying the constraints in adoption of improved dairy and crop farming practices is recommended.

LIVELIHOOD PATTERN IN PERI-URBAN AREA

A livelihood comprises the capabilities, assets (including both material and social resources) and activities required for a means of living (Chambers & Conway, 1992). Livelihood pattern of the farming community in peri-urban areas is different and diversified from that of the rural farming community, because of rapid urbanization changes in the land use pattern and the opportunities in the peri-urban region making peri-urban farming communities to divert into off farm activities and migrate towards cities in search of better employment opportunities that lead to change their household livelihood pattern slowly. In this study, livelihood pattern refers to efforts by individuals and households to find new ways to raise earnings that includes both on and off farm activities which are undertaken to generate additional income from the main household agricultural activities *viz.,* production of other agricultural and non-agricultural goods and services. Ellis, (1998) defines livelihood diversification or pattern in rural context as the process by which rural families construct a diverse portfolio of activities and social support capabilities in their struggle for survival and in order to improve their standards of living.

1.1 STATEMENT OF PROBLEM

The pressure on land has been mounting up at an alarming rate. Population growth, urbanization and industrialization are major contributory factors to it. India occupies 2.4 per cent of the total land area of the world, but supports 16.7 per cent of the world population. Total land area available for agriculture changes relatively little from year to year. In last decade alone 2.76 million hectares of land was converted for non-agriculture use in India. So trend changes in average farm size are ultimately driven by changes in total population due to rural out migration to towns and cities. In case of India due to simultaneous increase in the rural and urban as well as total population will cause the decrease in the per capita availability of farm land which affects food production in the country in future. Metropolitan cities have begun to grow rapidly

and unable to accommodate the growing population where cities start encroaching towards the adjoining peri-urban areas. This increase in trend of rapid urbanization and urban expansion influence the changes in the attempts by individuals and households in the adjoining peri-urban areas to find new ways to raised incomes for better livelihood especially to the farmers who are dependent upon their primitive occupations of agriculture and dairy in the peri-urban areas. Keeping in view all these conditions- discussed issues, some research questions were formulated for study, such as:

- What is the pattern of change occurred in dairy and crop production over the years in the peri-urban area of Bengaluru?
- What are the changes in livelihood pattern of the dairy and crop farmers over the years in the peri-urban area?
- How the farmers derive their livelihood on account of urbanization process?
- What are the specific needs and expectations of peri-urban dairy and crop producing farmers?

To find out the answers to all the above questions the study entitled as, ñ**Effect of Urbanization on Livelihood of Farmers in Dairy and Crop Production System in the Peri-urban area of Bengaluru**ò was undertaken with the following objectives for investigation:

1. To investigate the effect of urbanization in the current pattern of Dairy and Crop production scenario in the peri-urban area
2. To study the livelihood pattern exercised by the farmers and factors influencing upon them due to the urbanization process
3. To explore the scope and opportunities in Dairy and Crop production for promoting livelihood of farmers in response to pace of urbanization

1.2 SCOPE OF THE STUDY

The population density in Bangalore has risen 47 per cent in the past decade as job opportunities and economic growth have lured people from across the nation to Indiaôs Silicon Valley (Bengaluru). The increased growth in population is a

result of adding six new fringe areas around the Greater Bengaluru city (Revised Bangalore city development plan, 2009). The city growth is touching the rural borders which are considered as peri-urban areas which has led to several distortions producing adverse impact on the agriculture in the peri-urban area of Bengaluru (Kasturirangan report, 2008). Real estate activities and land acquisition in the peri-urban areas occupy the considerable precious farm land for the non-farm use. This will lead to drastic change in the livelihood condition of the fringe population especially those who depend on farming as their major livelihood activity over the years. This research mainly focuses both positive and negative aspects of urbanization on the farmers and change in livelihood pattern of farmers in the peri-urban area of Bengaluru. It is exactly not known how the farmers derive their livelihood on account of urbanization process. This is especially very important to understand their specific needs and aspirations so that is possible to generate appropriate strategies for promoting sustainable and profitable peri-urban crop and dairy farming. Finding of this study would help the policy makers, administrators and implementers to understand the change in farming situation in the peri-urban area of Bengaluru. It is a way for farm development programmes to make feasible and viable policies to make a balanced improvement in the quest of both agriculture and non agriculture keeping in view the increased food demand of growing population of Bengaluru and livelihood of peri-urban farmers. Exploration of livelihood options exercised by the peri-urban farmers would help to disseminate justifiable need based technological and social interventions for improving their livelihood conditions. Preparation of the appropriate extension strategies for peri-urban farmers might be helpful to concentrate on the efforts to improve the crop and dairy farming situation.

1.3 LIMITATIONS OF THE STUDY

Although, every effort was made to make this study as comprehensive as possible and considerable care has been exercised in making the study as objective and systematic as possible. But some limitations as faced during the course of investigation are indicated below:

1. Information collected was totally based on the expressed response, memory recall and perception of the peri-urban farmer respondents.

Hence, the complete freedom from individual bias and prejudice cannot be claimed, especially with regard to income and sale of land.

2. The study was carried out on the qualitative method of data collection to supplement the quantitative data. Some of the critical observations were explained according to the situation and on the basis of systematic observation during data collection. So, data were recorded according to the farmer perception and experience which sometimes leads to erroneous interpretation of results.

1.4 ORGANIZATION OF THESIS

The present thesis has been presented in five chapters.

1. **Introduction** ï It is the first chapter containing the relevant background information, statement of problem, objectives and scope of study along with its limitations.
2. **Review of literature** - This second chapter explains the relevant findings of past studies related to the problem under investigation.
3. **Research Methodology** ï The third chapter covers locale of the study, sampling plan, operationalizasation and measurement of selected variables, data collection and statistical tools applied to analyze the data are presented.
4. **Results and Discussion -** The forth chapter explains findings of the present study along with discussion.
5. **Summary and Conclusions** ï The fifth chapter deals with the summary and conclusions which have emerged from the results of the study.

In the end, bibliography and appendices information utilized in this study have been presented.

CHAPTER – 2

REVIEW OF LITERATURE

REVIEW OF LITERATURE

This study on Effect of Urbanization on Livelihood of Farmers in Dairy and Crop Production System in the Peri-urban area of Bengaluru was undertaken to understand the change in dairy and crop production system of farmers in the peri-urban situation as well as in their livelihood pattern and major factors influencing upon them due to the effect of urbanization along with opportunities and constraints of peri-urban farmers. Past knowledge is essential for better understanding of the situation under investigation which could provide insights about missing research gaps and update the relevant studies so as to draw meaningful interpretations. A number of studies have been carried out to depict and conceptualise change in peri-urban dairy and crop production system and factors affecting change in peri-urban livelihood pattern at the household level. Keeping in view the objectives of the study, review is presented under the following sub-headings:

2.1 Change in peri-urban crop production due to urbanization
2.2 Change in peri-urban dairy production due to urbanization
2.3 Livelihood options of peri-urban dairy and crop producing farmers
2.4 Factors influencing pattern of change in peri-urban livelihood due to urbanization
2.5 Effect of urbanization on peri-urban farming
2.6 Opportunities for peri-urban dairy and crop producing farmers
2.7 Constraints in peri-urban dairy and crop production

2.1 Change in peri-urban crop production due to urbanization

Jansen *et al*. (1996) carried out a study in peri urban Ho Chi Minh city, Vietnam on the profitability of peri-urban vegetable production systems (with rice and/or groundnut as additional crops) at house hold level and found significant higher returns with higher levels of inputs use. On an average, farmers derived over 70 per cent of their crop revenues from the sales of vegetables.

Lopez *et al*. (1988) in an extensive study of the effect of urbanization on agriculture in the north eastern United States, recognized that the loss of land that had been in agricultural production, as direct effect. They also categorized in four categories: regulatory effects, technical efficiency effects, speculative effects and market effects. For the most part, these indirect effects of development increase costs and thereby reduce the profitability of staying in production agriculture. Further, they found that production became more labour intensive with urbanization, and in terms of profits, only vegetable production benefited from the combined effects of development

Bhupal *et al.* (2001) found that vegetable crops like cauliflower, cabbage, carrot, spinach, okra, tomato and herbs such as fenugreek and coriander were cultivated in and around Delhi. The increase in the share of land use for vegetables was partly explained by proximity to the markets. Farmers aimed to maximise their income from relatively small land holdings by engaging, whole families. The relatively short growing periods combined with high inputs of irrigation water, pesticides, fertilizers and labour helped farmers to produce 3-4 vegetable crops per year from a given plot of land.

Fialor (2002) analysed the profitability of various types of cropping systems around Kumasi, Ghana. He observed that spring onion followed by pepper/garden-egg/okra ranked as best cropping patterns than other cropping patterns since they need very high investment in labour and fertilizer or manure. He concluded that onion followed by pepper/garden-egg/okra found to be most profitable investment regardless of the cost of production.

In a study by Drechsel *et al.* (2005) backyard gardening was widely practised by approximately 20 million urban dwellers in West Africa, mostly for subsistence. Market gardens mainly located in the open spaces in the West Africa and change the cropping pattern according to seasonal supply and demand and market prices. Intensification is sought through cultivating high-valued crops, increase in productivity on the same area of the land, and by maximising the use of available resource including wastewater.

Uma (2007) reported in her study on impact of urban waste water pollution of Bellandur and Vrishabavathi river valley on agriculture in the peri-urban Bangalore that education, occupation, mass media participation, farming experience, risk orientation, economic orientation have positive and significant relationship with the awareness while other variables have no significant relationship.

Egal *et al.* (2001) reported that an important part of the commercial production of fresh products takes place in peri-urban areas of southern Africa. Since urban areas do not have any real comparative advantage for commercial staple food production, staple foods are usually produced mainly for own consumption. The situation is different for vegetables. Green leaves used for the preparation of relish were grown for the household consumption but exotic varieties we usually grown for income generation purposes, however the surplus is consumed by producers.

Raju (2011) in his study conducted in proximity of Magadi town, Ramanagara district of Karnataka on economic analysis of different peri-urban agriculture enterprises indicated that the flower production is more profitable followed by vegetables, plantation crops and field crops as the return to cost ratio is highest in flowers (3.3) followed by vegetables (2.0), plantation (1.9) and field crops (1.6) food production from peri-urban farmers has not been adequate to meet their consumption needs indicating the weakening of household food security of peri-urban farmers.

Jagriti (2013) in study with 120 respondents in NCR Delhi, revealed that the average production of dynamics index of the farmer in the study area was 65.56 it was found out that 83.33% of farmers were in the dynamic categories followed by 12.5% highly dynamic and 4.16% in least dynamic category of production dynamics and results shows that 5.12% of farmers had vegetables as their most preferred enterprise.

Venu (2014) studied the retail markets of vegetables and its implications in peri-urban agricultural system in NCT Delhi region and revealed that for the period 2005-13 growth rates in area as well as production was positive only for okra, growth yield was positive for potato (8.07%) and okra (7.7%). Except for rice and

okra all other crops grown in the study area observed vegetative growth in area under cultivation, this might be due to large scale of urbanization of rural area highlighting the need to focus on peri-urban agriculture for increasing food security, poverty alleviation and environmental sustainability.

2.2 Change in peri-urban dairy production due to urbanization

Tengene *et al.* (2000) inferred that in Addis Ababa, Ethiopia, 20 million litres of non-pasteurized milk came from backyard city farms and are sold directly to the consumer by the producer. Above-normal profits are earned with very low capital input by even the smallest-scale backyard owners of inner city dairy units, who are generally women

Fialor (2002) analysed the profitability of various livestock system in Kumasi, Ghana. Although the cattle enterprise gives the maximum profit per unit, this is only possible when herd size range from one to five animals. Space requirements, waste disposal and feed availability were the major factors to consider for propagating large herd size.

Joshi *et al*. (2004) examined the agriculture diversification in South Asia. He observed South Asian countries are gradually diversifying with the same intra country variation in favour of high value commodities, namely, fruits vegetables, and livestock.

2.3 Livelihood options of peri-urban dairy and crop producing farmers

Bhupal *et al*. (2001) in their study on peri-urban agriculture in Delhi stated that peri-urban agriculture is not only a significant and dynamic land use for poor people and farmers with small living in urban areas in India, it is also a very important livelihood strategy, providing families with employment, income and food.

Deng *et al*. (2006) indicated that farmland shrinkage due to urbanization has negative impacts on livelihood strategies that largely or partially depend on farmland or other natural resources. In China, an immense area of farmland has been encroached by urbanization and such encroachment raises special concerns about rural livelihoods

Takanashi and Iwamoto (2009) studied that the outflow of labour to the urban area become actual, especially permanent agricultural labour was decreasing and income from agricultural activity was highly increased but that was yield by a few upper class farmers. The rest of farmers got their income mainly from agricultural activity and their production was self-sufficient.

Hillyer *et al*. (2001) from their findings of the study in peri-urban area of Hubli and Dharwad with 160 respondents, showed that peri-urban respondents derive their livelihood from different sources like Agriculture (26%), Dairy (14%), Business (4%), Artisan (2%), Commercial labour (12%), Agriculture labour (11%) etc and results also showed that the least number of respondents were depending on agriculture in the peri-urban area of Hubli and Dharwad for major part of their livelihood.

Tuyen (2011) in their study in Hanoi city (Vietnam) on peri-urban livelihood and land acquisition revealed that households had actively adapted to the new context by adopting livelihood strategies based on manual jobs and nonī farm selfī employment activities. While larger owned farmland stimulates households to specialize in farming, emerging nonī farm job opportunities make rural young workers less interested in farming activities. They suggested bringing policy prescriptions in order to help periī urban households to effectively change and diversify their livelihoods.

2.4 Factors influencing pattern of change in peri-urban livelihood due to urbanization

Tarveer (1996) reported that in Africa, most people move into the urban areas because they are ópushedô out by factors such as poverty, environmental degradation, religious strife, political persecution, food insecurity and lack of basic infrastructure and services in the rural areas or because they are ópulledô into the urban areas by the advantages and opportunities of the city including education, electricity, water etc. Even though in many African countries the urban areas offer few jobs for the youth, they are often attracted due to the amenities of urban life.

Larson *et al*. (2000) stated that other measures of urbanization, such as proximity to a city or inter-state highway had no statistically significant effect on farm practices. They further discussed that urbanization puts pressure on farms and farmers to change or adapt. These changes can take the forms of selling land, reducing farm operations, moving to more land-intensive or high-value enterprises, engaging in nontraditional activities that cater to urban populations, and earning income from off-farm work. Considerable public policy efforts are focused on alleviating these pressures to enable farmers to continue farming as they have.

Joshi *et al.* (2004) examined the agriculture diversification in South Asia. He also states that the agriculture diversification is strongly influenced by price policy, infrastructure, development and urbanization. Agricultural diversification is also contributing to the employment opportunities in agriculture and increase in exports. The extent of diversification was noticed with respect to the cropping patterns livestock, dairy and fishery.

Anh *et al. (*2004) reported that the total demand of food in Hanoi is over 1.0 million tonnes distributed as 56 per cent and 44 per cent in urban and peri-urban areas, respectively. Even production in peri-urban Hanoi, considered to be a hub for agricultural activities was not sufficient to meet own demand for and beans, milk, eggs and honey. However the surplus in peri urban food supplies can meet the entire urban gap in tuber demand, 10% of cereals and vegetables, 40% of red meats and 12% gap of poultry meats. Overall, it can hardly met 3 % of the gap in the urban demand and supply.

Letha (2007) in her study in peri-urban areas of Idukki and Ernakulam districts showed that majority of respondents were not depending on agriculture. In fact service sector provided livelihood means for majority of peri-urban population. This could be related to declining area under agriculture in peri-urban area. The industrial sector also employed a considerable percentage of women in peri-urban area (25% and 10% in young and old groups respectively), this might due to much attractive offers from the industrial and service sectors both in terms of opportunities as well as regular and continuous income in peri-urban area.

Pawan (2010) in his study in the Bangalore rural district of Karnataka showed that the availability of land for agriculture purpose has been decreased by 21.11 and 15.54 per cent in high and low urban influenced villages, respectively. Whereas land utilization for industrial and residential use has been increased considerably in both high and low urban influenced villages and also study reveals that the number of persons depending upon agriculture had been declined by 12.98 and 7.92% in high and low influenced villages respectively.

Singh and Shruti (2014) in their study on ñDepeasantization in Punjab: status of farmers who left farmingò showed that the marginal and small farmers are leaving farming at an increasing rate since 1991 compared to their larger counterparts. Of the 288 depeasantized farm families, the highest proportion (43.75%) left farming since 2008. Economic reasons are the main factors which influence the decision of farmers to shift away from agriculture, who in search of better employment or business opportunities take up other professions. One of the most common reasons for which farmers (30.56%) left farming was its non-profitable nature. About 53% of marginal farmers, 18.4% small farmers, 13.79% of semi-medium farmers and 11.76% medium farmers left farming as it was a non-remunerative venture. Joining other professions was the second most common reason for which about 19% of the total sampled farmers left farming. Of the total farmers, 17% of the marginal farmers, 23% of the small farmers, about 7% of the semi-medium farmers, 12% of the medium farmers and 33% of the large farmers left farming as they joined other professions.

2.5 Effect of urbanization on decreasing peri-urban farm land

Cherunilam (1984) analyzed the urbanization process in developing countries. According to him, urban population has increased at a higher rate than the rural population. He further pointed out that if urban explosion is not checked effectively; rural characteristics will be completely vanished by the 21st century.

Lockeretz (1988) in an extensive study of the effect of urbanization on agriculture in the north eastern United States found little correlation between increased development and a reduction in farming.

Rees (1992) emphasized that urbanization leads to the outward expansion of cities and results in changes in land use whereby urban residents buy up prime agricultural land for residential or commercial purposes. The conversion of farm lands and watersheds for residential purposes have negative consequences on food security, water supply as well as the health of the people, both in the cities and in the peri-urban areas.

Tokuda (1993) analyzed changes in agriculture and land use brought about by urbanization in the Tokyo metropolitan area. Outside a radius of 40 km from central Tokyo, the number of farms and farmland is decreasing slowly, while increases in the value of agricultural production are at the rate of the national average. Urbanization is a main cause of the decline in agriculture in the area. Hydroponic farms have evolved in relatively urbanized areas, group farming in rice has evolved in less urbanized areas and vegetable farms have evolved in moderately urbanized areas.

Fazal (2000) reported that Indian rural householdsôhad faced the challenge of farmland loss on a large scale. Between 1955 and 1985, approximately 1.5 million hectares of farmland were converted for urban sprawl in India.

Nguyen (2009) indicated mixed impacts of farmland acquisition on local people based on his case studies in the peripheries of Hanoi and Ho Chi Minh City. A case study in a periī urban village of Hanoi showed that after land loss, some rural households combined their land loss compensation money with their natural capital in the form of residential land assets to not only overcome distress but to engage successfully in nonī farm activities.

Quasem (2011) claimed that every year about one per cent of farm land in the Bangladesh country is being converted to non-agricultural uses (such high rate of conversion will not only hamper agricultural production but will have adverse impact on food security). His study estimated the rate of land conversion and consequent loss of agricultural production of the country besides determining the factors affecting such conversion. That implies that the rates of land conversion were higher in metro and urban villages and also among the land poor and thereby making more vulnerable to food insecurity.

2.6 Opportunities for peri-urban dairy and crop producing farmers

Rao (1983) emphasized that urbanization needs to be equated not only with increasing employment in non agricultural sector and the associated higher technology and income levels but also with urban infrastructure, both economic and social aspects to promote dispersal of development and the quality of the people.

Sokolow (2000) discussed about incompatible land uses and economic opportunities for local agricultural due to urbanization. He argued that agricultural areas are desirable locations for new houses, both because farm land is relatively inexpensive and it has visual and other open space amenities. The negative impacts also flow in the other direction, as adjacent or nearby residential development burdens working farms with pilferage, vandalism, trespassing, marauding dogs, and other intrusions-forcing changes in practices and making it difficult to continue farming in such edge situations. Further, he stated that there are economic advantages for local agriculture due to close proximity to urban populations. With such proximity comes the potential for direct marketing of certain commodities and the possibilities of agritourism. Certainty there is added value for both farmers and urban neighbors in reducing the distance between producers and consumers.

Ponnusamy and Gupta (2005) based on their study in Periyaoblapuram village in Tiruvallur district of Tamil Nadu on pattern of diversification of crops and its implications for socio-economic betterment revealed that declining productivity of certain crops and enterprises is major concern of not only farmers but also other stakeholders including the policy makers and development workers. Alternative farming systems form the prime mover of agricultural diversification. The changes in the cropping systems should ensure reasonable profit apart from providing food, nutrition and employment security. Understanding these systems is complex and more so altering the system unless practiced under a strong compulsion.

Vishal (2009) in his study in the peri-urban region of Gurgoan showed that the expansion of the city has altered patterns of rural natural resource use, created social, cultural and economic changes, and bred resentment among many peri-

urban residents against urban authorities. The current top-down policies for land acquisition need to be revisited and replaced by more participative processes in which landowners and peri-urban residents themselves are involved. The speedy disbursement of reimbursements for lands acquired, and the spread of livelihood generation activities, could make processes of urbanization more inclusive and participatory.

Narsin (2012) in the study in the peri-urban interface of Aligarh city in Uttar Pradesh revealed the fact that there is intense pressure on agricultural land in the urban fringe area for commercial purposes. But the farming activity for high valued perishable crop cultivation and dairy are prominent due to growing urban population.

Mallika and Suresha (2012) conducted a study on impact of contract farming on economic status of farmers in selected districts of Karnataka and noticed that majority of the farmers suggested that settling of payments should be in time. They also suggested that cost of inputs should be reduced by the contract firms and increase the price for the produce. Half of the respondents suggested that there should be government intervention for making strict laws to legalise the contracts. Few of the farmers suggested that more multinational companies (MNCôS) should be allowed to do agribusiness.

Nethravati (2008) reported in her study on participation of farm women in post-harvest technologies of tomato in Kolar district that majority (66.67%) of the respondents suggested to make arrangements in supply of post-harvest equipments, insecticides, fumigants, fertilizers, good seeds and better water sources at their own villages and slightly more than half (51.67%) of them suggested that technological guidance to be imparted to farm women through effective extension activities in post-harvest operations followed by 31.66 per cent providing subsidy and 14.17 per cent suggested for better transportation facilities.

Ponnusamy and Lal (2014) in their study on ñGDFPs and role of developmental agencies in its promotion, Published in compendium of Model Training Course on GDFPs: A way forward for organic farmingò reported that in India present challenge is rampant adulteration in milk and milk products- traditional sweets

are losing charm and people prefer to gift chocolates, dry fruits in festive season, instead of the traditional milk-made sweets. So, it is vital to regain the faith among the consumers through GDFP. Moreover, milk produced through GDFP may be costlier than the traditional or unhygienic practices but little bit higher price of milk is not a bottleneck at least in peri-urban and urban area as evident from Bhagyalaxmi Dairy Farm in Pune.

Ponnusamy and Lal (2015) in their study on ñChallenges and Opportunities in Promoting Good Dairy Farming Practicesò explained that GDFP is more practicable and attainable method than any other existing methods indicating a need for hybrid or collective approach to produce more milk at affordable prices in both rural and peri-urban areas.

2.7 Constraints in peri-urban dairy and crop production

Manoharan *et al*. (2003) based on their study in Pondicherry observed that the major constraints faced by farmers in dairy farming were higher feed cost, low price for milk, high investment, infertility problem, low productivity, higher rate of calf mortality, frequently becoming sick, inadequate availability of grazing lands, costly veterinary treatment and aids.

Gowda (2005) in his study on knowledge and adoption level of soil and water conservation practices by farmers in north Karnataka reported that 90.00 per cent of the respondents faced the problem of price fluctuation followed by 65.00 per cent expressed the problem of pest and diseases.

Pushpa (2006) reported was expressed Scarcity of labour (33.75%) as a major constraint of peri-urban respondents, high labour charges (21.25%) and high cost of fodder (27.5%), scarcity of green fodder by (15%) were other important problems reported by her.

Jalil *et al*. (2009) studied the constraints in the milk production system in the peri-urban areas of Lahore and observed that the lack of training and dairy related education hinders opportunity of value addition with undue cost of poor transportation, low quality and mismanaged distribution. They also opined that lack of marketing and supply chain in dairy industry is another bottleneck of development.

Chah *et al.* (2010) pointed out in their study on assessment of the contribution of urban crop agriculture in Nigerian cities that destruction of crops by stray animals (80%), theft (75%) and lack of information (65%) were the major constraints identified. Other included no land (40%), pest (35%), harassment by government officials (33.33%), lack of capital (28.33%) followed by lack of tools (20%), lack of water (13.33%), poor soil fertility (10%) and insufficient labour (8.33%).

Duguma *et al*. (2011) in their study on analysis of facing urban dairy farmers and gender responsibility in animal management in Oromia revealed that the lack of land (50%), shortage of feed (38.90%), lack of improved animals (5.60%) and lack of access to artificial insemination (3.70%) were constraints limiting the dairy production along with lack of extension services, disease, lack of credit services and market problem during fasting period.

Raju (2011) investigated the constraints in peri-urban crop production. He revealed that non availability of irrigation, the farmers constrains to grow commercial crops in increase in cost of their inputs and non availability of labour. Increase in labour wage ranked is least. With respect to production constrains, non availability of labour for agricultural operations was ranked as first, followed by high labour wages, non availability of arable land for agricultural production, non availability of irrigation water, increasing cost of inputs and pest and disease menace were the important production constrains by peri urban farmers.

Varaprasad *et al.* (2013) observed the constraints faced by the dairy farmers in Andhra Pradesh as low price paid by the procurement agencies per litre milk, high cost and non availability of feed ingredients, high incidence of repeat breeding, lack of sufficient grazing land, and non-availability of the vaccines in time. Non-availability of medicine in time in the hospitals and incidence of Theileriasis and mastitis were other major health constraints.

Gunaseelan (2014) in his study undertaken in the peri-urban area of the Thanjavur district of Tamil Nadu with 120 farmers revealed that half of them sold fresh milk to the consumers followed by milk vendors and cooperative society. Education, farming income, economic motivation and milk production had positively and significantly contributed towards the variability in the adoption level of improved dairy farming technologies. Lack of grazing fields, high incident of

diseases in the cross bread animals and lack of green fodder cover the most serious constraints encountered by majority of peri-urban farmer respondents.

Kumar *et al*. (2011) found out that the non availability of the fodder round the year (72%), was the major constraint followed by the high cost on feeding and storage of feed (67%), disease occurrence (58%), inadequate knowledge about feeding (56%), lack of timely artificial insemination (47%), scarcity of capital (46%), lack of timely veterinary services (43%), seasonality of demand for the milk (40%), high cost of medicine and treatment (39%), low price of milk (50%), and lack of credit facilities (32%) were constraints limiting dairy production in Mekelle, Ethiopia.

CHAPTER – 3

RESEARCH METHODOLOGY

RESEARCH METHODOLOGY

Research methodology is a way to systematically solve the research problem. This chapter deals with description of methods and procedures employed during research programme to fulfill the requirement of the objective. This is considered as the ôblue printô of the research architect. This chapter has been organized under the following sub-heads:

3.1. Research design

3.2. Locale of the study

  3.2.1 Description of study area

3.3. Sampling plan

  3.3.1 Selection of state

  3.3.2 Selection of district

  3.3.3 Selection of blocks, villages and respondents

3.4. Variables and their measurement

3.5. Operationalisation of variables

3.6. Tools and instruments of data collection

3.7. Tools for statistical analysis of data

3.1. RESEARCH DESIGN

According to Kerlinger (1978), ñresearch design is the plan, structure and strategy of investigation so as to obtain answers to research questions and to control varianceò. For this study, expost-facto design was used, since the study aimed to track the changes happened among the livelihood pattern of farmers on account of urbanization process. Instead of applying a treatment, the researcher had studied the effects of the phenomenon which has already occurred, hence, there was no scope for manipulation of any variable.

3.2 LOCALE OF THE STUDY

The present study was undertaken in peri- urban area of Bengaluru in Karnataka state. The reasons for purposive selection of state are described as under:

i. Karnataka is India's 7th most urbanized State in India, with 38 per cent of its population living in urban areas (Census, 2011).

ii. The level of urbanisation in Karnataka increased by 4.58 per cent, from 33.99 per cent (2001) to 38.57 per cent (2011). As compared with India, the urbanization growth rate is higher in Karnataka. The state is expected to reach an urban population proportion of 50 per cent in the next 11 years (2026).

iii. There are limited studies on urbanization and its impact on the livelihood pattern of farmers living in the periphery of urban areas in the state.

iv. Among the six metropolises in India, Bengaluru city is in Karnataka which witnessed urbanization at a much faster rate due to flourishing IT and other service sector.

3.2.1 DESCRIPTION OF STUDY AREA

This research is mainly focused on the peri-urban area of Bengaluru[1]. For the purpose of study Peri-urban area of Bengaluru is defined as the region around the Bengaluru city periphery which includes Bangalore urban and rural districts which falls under Bengaluru metropolitan region characterized by the semi-urban characteristic (urban influence). In the peri-urban region, agriculture and dairy are being practiced as major livelihood among the people. Bengaluru is the capital city of the Indian state of Karnataka. It is located on the Deccan Plateau in the south-eastern part of Karnataka. According to 2011 census Bengaluru is India's third most populous city and fifth-most populous urban agglomeration. Bengaluru is known as the "Silicon Valley of India" because of its role as the nation's leading information technology (IT) exporter. Located at a height of over 3,000 feet (914.4 m) above mean sea level, Bengaluru is known for its pleasant climate throughout the year. The city is amongst the top ten preferred

[1] *Bengaluru – Earlier name of Bangalore was officially changed to Bengaluru from Nov. 2014*

Fig. 3.1: Map of Karnataka state

Fig.3.2: Peri-urban area of Bengaluru

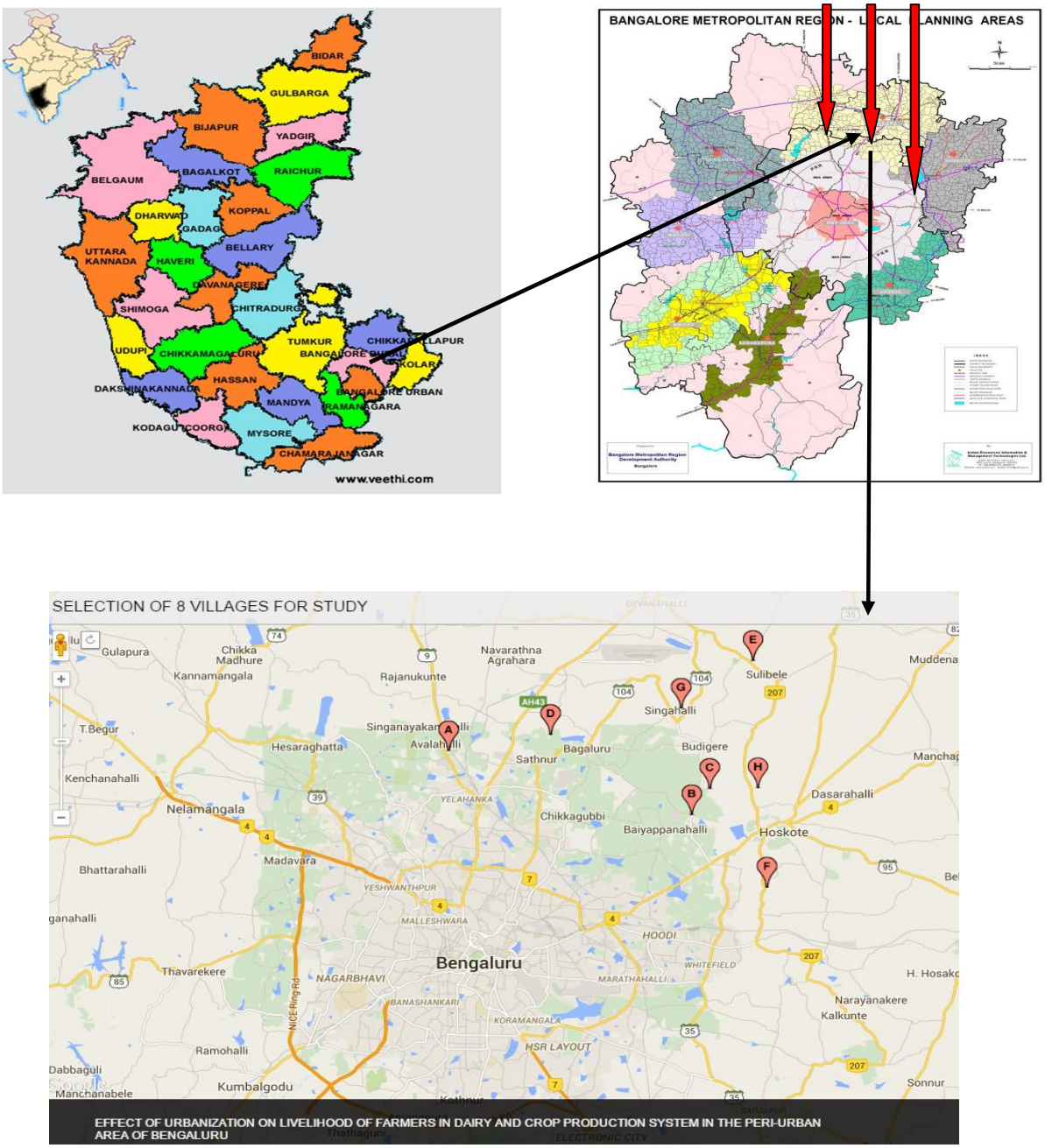


Fig. 3.3: Map of Bengaluru peri-urban area showing the exact location of villages selected for the study.

entrepreneurial locations in the world currently with a population of more than 10 million. It is notable that since the first census, Bengaluru was already the most populous city in Karnataka. Open spaces generally, were seriously affected however with the enhanced demand for real estate and infrastructure` consequent to urbanization that leads to great threat to agriculture and dairy enterprises in the periphery of the Bengaluru metropolitan region (Bengaluru urban and rural districts).

3.3 SAMPLING PLAN

3.3.1 SELECTION OF STATE

Karnataka is a state in South West India. It was created on 1 November 1956. The capital and largest city is Bengaluru. Karnataka is bordered by the Arabian Sea and the Laccadive Sea to the west, Goa to the north west, Maharashtra to the north, Telangana to the North east, Andhra Pradesh to the east, Tamil Nadu to the south east, and Kerala to the south west. The state covers an area of 191,976 square kilometers (74,122 sq mi), or 5.83 per cent of the total geographical area of India. It is the Seventh largest Indian state by area, with 61,130,704 inhabitants at the 2011 census. Karnataka ranks 11th in overall milk production in the country though the State is the second largest milk producer in the cooperative sector after Gujarat (The Hindu, 2013). Karnataka is the eighth largest state by population, comprising 30 districts. Nearly 56 per cent of the workforce in Karnataka is engaged in agriculture and related activities. A total of 12.31 million hectares of land, or 64.6 per cent of the state's total area, is cultivated (Census of Karnataka, 2011). Karnataka is now among the most urbanized states in India with more than 38 per cent of its population living in urban areas. The level of urbanization in Karnataka increased by 4.58 per cent, from 33.99 per cent in the 2001 Census to 38.57 per cent in 2011, while the level of rural population declined from 66.01 per cent to 61.43 per cent (The Hindu, 2011).

3.3.2 SELECTION OF DISTRICTS

Out of 30 districts of Karnataka state, Bengaluru metropolitan region (Bengaluru urban and rural districts) was selected purposely, as research is mainly focused

on the peri-urban area of Bengaluru. For this study, Peri-urban area of Bengaluru is demarcated by the region around the Bengaluru city periphery which includes Bengaluru urban and rural districts falling under Bengaluru metropolitan region reflecting the semi-urban characteristic (urban influence). In peri-urban area, farming with crop and dairy enterprises are prevalent supporting large number of resource poor farm families for their livelihood.

Reasons for the purposive selection of Bengaluru

On the basis of identified objectives pertaining to the study and ascribed reasons as below per-urban area of Bengaluru (Bengaluru rural and urban districts) was selected purposively for the study.

i. Bengaluru is the most urbanized city in Karnataka

ii. Bengaluru is the most urbanized district with 90.94 per cent of its population residing in urban areas and current population of Bangaluru in 2014 is 10,178,146.

iii. Bengaluru is India's third most populous city and fifth-most populous urban agglomeration.

iv. There is a decreasing number of cultivators (Three lakh cultivators) in Karnataka from 2001 to 2011, where Bengaluru rural district had registered highest decreasing rate of -9.55 per cent.

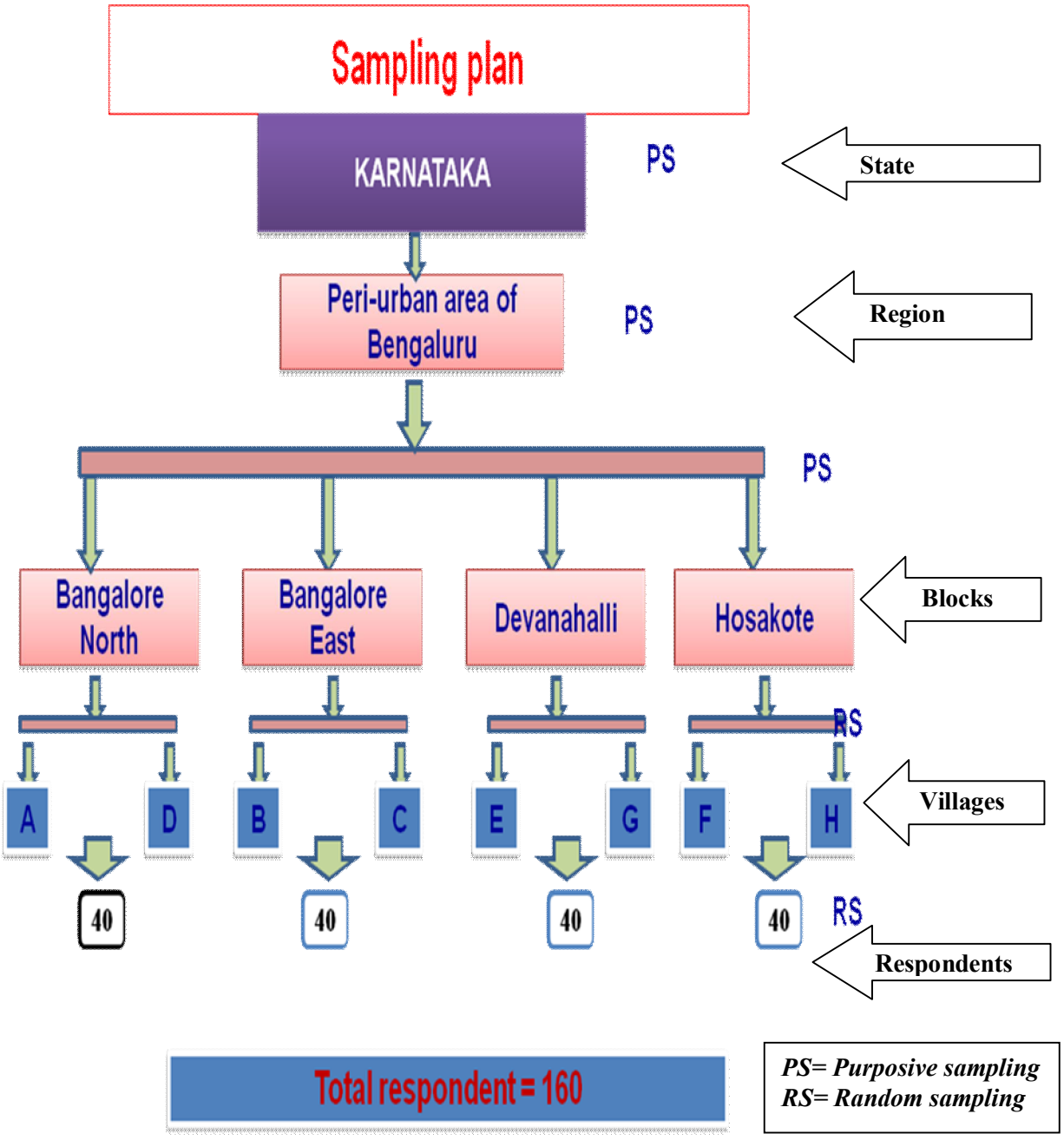
v. The city is amongst the top ten preferred entrepreneurial locations in the world.

vi. It attracts huge migrant population across the country. As a consequence to increasing urbanisation, there is a greater threat to crop and dairy farming in the periphery of the Bengaluru metropolitan region.

3.3.3 SELECTION OF TALUKS, VILLAGES AND RESPONDENTS

Four blocks around the city periphery were selected purposively due to its peri-urban characteristics *viz*., Bengaluru north, Bengaluru east taluks of Bengaluru urban district and Devanahalli and Hoskote taluks from Bengaluru rural district. Two villages were selected randomly in each block. From each village, 20

Fig. 3.4: Diagrammatic representation of sampling plan



respondents were selected randomly. Hence, a total of 160 respondents constituted the sample size for the study.

The location of the village is given below with address (Alphabets in the description indicate the location of the villages in study map):

A - Nagenahalli, Bengaluru urban, Karnataka 560064

B - Mandur, Bengaluru urban, Karnataka 562129

C - Jyothipura,Bengaluru urban, Karnataka 562129

D - Hosahalli,Bengaluru urban, Karnataka 562157

E - Balepura Bengaluru rural, Karnataka 562129

F - Doddagattiganabbe, Bengaluru rural Karnataka 562114

G - Bhatramarenahalli, Bengaluru rural Karnataka 562129

H - Kallahalli, Bengaluru rural Karnataka 562114

3.4 VARIABLES AND THEIR MEASUREMENT

In social science research, it is expected to precisely mention the variables which are used for the study with their working concepts and measurement procedures. In the present study, the investigator made an exhaustive review of the available literature on urbanization and its effect on livelihood of farmers and intensive discussion with the experts. Table 3.4.1 depicts the variables and their measurement at a glance.

Table 3.4.1 Variables and their measurements

Sr. No.	Variables	Measurement
A	**Socio-personal variables of respondents**	
1	Age	Direct questioning
2	Sex	
3	Caste	
4	Education	

5	Family type	Schedule was developed
6	Family size	
7	Family education status	
B	**Change in Crop and Dairy production system**	
8	Change in livestock population	Trend and growth rate
9	Change in area under major crops	
10	Change in herd size	Schedule was developed
11	Cropping pattern under various crops	
C	**Change in livelihood pattern**	
12	Major Occupation	Schedule was developed
13	Subsidiary occupation	
14	Combination of household occupation	
15	Adding of new occupation	
16	Occupation left	
17	Annual income	
D	**Factors influencing livelihood due to urbanization**	
18	Size of land holding (2000)	Schedule was developed
19	Size of land holding (2014)	
20	Land sold pattern	
21	Money utilization from land sold	
22	Change in monthly family expenditure	

3.5 OPERATIONALISATION AND MEASUREMENT OF VARIABLES

The objective wise operationalisation of concept and measurement of variables are given below:

3.5.1 Age

It was operationalised as the number of completed years of the respondentûs life at the time of investigation. It was ascertained by direct questioning. The respondents were classified on the following three categories viz., young, middle and old age based on the Census report of GOI (2011)

Sr. No	Category	Years
1	Young	Upto 35
2	Middle	36 to 50
3	Old	Above 50

3.5.2 Sex

Sex has always been a distinguishing segmentation variable. The respondents were thus categorized as male and female respondents.

Sr. No.	Sex	Score
1	Male	1
2	Female	2

3.5.3 Caste

It refers to a social category, whose members are assigned a permanent status within a given social hierarchy. It was measured by direct questioning and modified scale of Trivedi (1963) was used for scoring.

Sr. No.	Caste	Score
1.	General	1
2.	Other Backward Caste	2
3.	Schedule Caste/ Schedule Tribe	3

3.5.4 Education

It was defined as the level of formal education acquired by the individual respondents from school to university level. Based on this, the respondents were categorized into five categories as fallowed by Pavan (2011) with scores as follows.

Sr. No.	Category	Score
1	Illiterate	0
2	Primary	1
3	Matriculate	2
4	Intermediate	3
5	Graduate and above	4

3.5.5 Family type

Family type is divided according to family member living in one place according to blood relationship:

Sr. No.	Family type	Score
1.	Single	1
2.	Joint	2

3.5.6 Family Size

Family size was referred to number of individuals dwelling under the same roof. It was measured by giving one score to each individual in the family and respondents were categorized into small, medium and large on the basis of mean and standard deviation.

Sr. No.	Category	Score
1	Small (<5 members)	1
2	Medium (5-7 members)	2
3	Large (>7 members)	3

3.5.7 Family Education Status (FES)

It referred to the educational status of the respondent and family members eligible for formal education i.e. above six years of age. This was measured with the help of a schedule developed for this purpose, and was calculated by the following formula:

$$\text{Family Education Status (FES)} = \frac{\text{Total educational score of the family}}{\text{Number of eligible members in the family}}$$

On the basis of FES score, the respondents were categorized into low, medium and high categories, pas per mean and standard deviation. The categories have been given as below:

Sr.No.	Category	Score
1.	Low	<1.1
2.	Medium	1.1 to 2
3.	High	>2

3.5.8 Change in livestock population

Change in livestock population is referred as increase or decrease in the population of cattle, buffalo and total livestock in the Bengaluru urban and Bengaluru rural districts over a period from 1997 to 2012. It was measured in percent change and census growth rate based on secondary data from livestock census.

3.5.9 Changes in area under major crops

A change in area under major crops is operationalised as increase or decrease in total area under different crops over a period from 2000-01 to 2013-14. The total area under crops sown in Bengaluru urban and Bengaluru rural districts which includes crops *viz.*, total cereals, total pluses, oilseeds, commercial crop,

total vegetables, total spices and total fruit crops. It was measured by showing trend of increase or decrease in area over a period from 2000-01 to 2013-14.

3.5.10 Change in herd size

Change in herd size was operationalised as total number of bovine animals possessed by the respondent over a period from 2000 to 2014. It was measured by showing trend of decrease or increase in the animal holding.

3.5.11 Cropping pattern under various crops

It was operationally defined as change in the cropping pattern i.e. type of crops grown by the respondents over the period from 2000 to 2014.

3.5.12 Occupation

It referred to the family's economic activities to earn livelihood. The economic activities were sub divided into Major as well as subsidiary occupation. Further, nine predominant occupations *viz.*, Crop production, Dairy farming, Sericulture, Commercial poultry farming, Agriculture labour, Artisan /craftsmen, Small scale business, Manual worker in industry, Real estate activity, Govt./Private job and Others (Includes electrician, mechanic etc.). From this list, the respondents were asked to indicate their primary and secondary occupations. It was measured with the help of a schedule.

3.5.13 Annual income

It refers to the annual income of the respondents and other family members obtained from different sources like agriculture, services, enterprises and/or from any other source(s). The annual income of the respondents was divided into three categories based on mean ± 1/2S.D.

Sr.No.	Category	Rupees
1	Low	<50000
2	Medium	50000 to 420000
3	High	>420000

3.5.14 Size of land holding (2000)

It was operationalised as the land possession by the respondents in the year 2000. The respondents were asked to tell exact land holding in the year 2000 and this was measured with the help of a schedule.

3.5.15 Size of land holding (2014)

This referred to the exact land of an individual farmer possessed. The total area was classified into following four categories classified by the GOI in 2010-11. The five categories were classified as below.

Sr.No.	Category	Size
1	Marginal	Upto 1 hectare
2	Small	1-2 hectare
3	Medium	2-4 hectare
4	Semi-medium	4-10 hectare
5	Large	10 hectare and above

3.5.16 Money utilization from land sold

It was operationalised as the respondents who sold their land were asked to indicate the amount of money obtained from selling land and asked them to explain how they utilized that money obtained from the selling of land for the different purposes *viz.* house construction, marriage, purchase of land, deposit in bank, investment in business, investment in agriculture equipments (tractors, tillers etc.), investment in luxurious items (car, bike etc.), utilized for personal expenditure, others includes childrenôs education, gold purchase etc.

3.5.17 Change in monthly family expenditure

It was operationalised as the average amount of money spent in a month on the different goods and services in a year. The respondents were asked to indicate the increase or decrease in expenditure with approximate value in rupees spent over the five year interval from 2000 to 2014.

3.6 TOOLS AND INSTRUMENTS OF DATA COLLECTION

For the collection of data, a well semi-structured interview schedule was developed. Necessary precautions were taken to ensure that the questions in the schedule were presented in an unambiguous, clear, concise complete and comprehensive manner. The interview schedule was pre-tested in non- sampled (pretested villages not selected for final study) peri-urban villages of Bengaluru and the interview schedule was finalized for the study. After finalizing the data collection schedule, the data were gathered by personally interviewing the respondents.

SWOT Analysis

The SWOT analysis was carried out with the a sample of 20 farmer respondents having mixed group of different farm enterprises in order to understand the changes in the structure and functioning of peri-urban farming system and derive the information about the strengths (S), weakness (W), threats (T) and opportunities (O) of the peri-urban crop and dairy production system. The selection of respondents was made by keeping in mind their in-depth subject knowledge and various practical experiences they gain during their course of profession. The session was beginning with three steps; first step is introduction of topic, second information gathering and final part is critical discussion. In the first step discussion and brief explanation about the purpose of the SWOT analysis and background of the study with stressing exclusively focus on the peri-urban areas and asking farmers to express the possible strengths, weakness, opportunities and threats on by one for crop production and dairy production system. Then their opinions, knowledge and experiences were collected and recorded. Then at final step, respondents were asked to discuss about the recorded statements and according to majority acceptance basis the statements were modified. Again the recorded sentences were given to the extension experts for their opinion and suggestions. Then the suggestions were incorporated and various statements recorded as shown in the Table 4.9.2 and Table 4.9.3. After gap of three days again the same groups were asked to gather and readout the final statements and ask them to give the ratings for each

statement with cross marks ratings as mentioned below according to the importance for the statements on majority basis. Then respective cross marks assigned in front of statement in table and interpretation was done accordingly.

xxxxx - Greatest strength/weakness/opportunity/threat

xxxx - Greater strength/weakness/opportunity/threat

xxx - Medium strength/weakness/opportunity/threat

xx - Lesser strength/weakness/opportunity/threat

x - Least strength/weakness/opportunity/threat

Focus Group Discussions (FGDs)

Focus Group Discussions (FGDs) were conducted in order to reveal the changes occurred due to urbanization in the livelihood of the peri urban farmers. Predetermined check-list questionnaires were employed to gather information during the FGDs. However, the selected FGDs groups were asked with predetermined questions during the discussion to understand the detailed background of phenomenon (relevant facts from urbanization). During the discussion the care has been taken to ensure free flow of interaction and the structured questionnaires helped to cover the core purpose of the FGDs. In order to avoid passive questioning and answering during discussion, all the participants were motivated to involve and contribute equally to make discussion more effective.

3.7 TOOLS FOR STATISTICAL ANALYSIS OF DATA

The collected data were classified and tabulated in order to measure the objectives of the study. Based on the nature of the study, the tabulated data were analyzed statistically with the help of the explained statistical methods.

3.7.1 Frequency

This was used to find out the number of respondents in each cell.

3.7.2 Percentage

The percentage value was calculated to make simple comparisons. Percentage value was calculated by dividing the frequency in the particular cell by number of respondents and multiplying it by 100.

$$\text{Percentage (P)} = \frac{n}{N} \times 100$$

Where,

n = Frequency of particular cell

N = Total number of the respondents in a particular cell

3.7.3 Mean

The arithmetic average of the set of the data had to be often computed during the analysis of data. This measurement was used to see the central tendency of the data. The mean score of a series of data was equal to the sum of the individual measures divided by the total number of respondents. The mean scores for each group were worked out by computing with this formula:

$$X = \frac{\sum X_1}{N}$$

Where,

X = Mean

$\sum X_1$ = Sum of each of the individual measurement of the scores

N = Number of respondents

3.7.4 Standard Deviation

The standard deviation is defined as the square root of the mean of the squared deviations of individual values from their means. It indicates a sort of group standard spread of values around their mean.

3.7.5 Percent (Straight-Line) Growth Rates

The percent change from one period to another was calculated from the formula:

$$PR = \frac{(V_{Present} - V_{Past})}{V_{Past}} \times 100$$

Where:

PR = Percent Rate (% increase / decrease)

$V_{Present}$ = Present Value

V_{Past} = Past Value

The Annual percentage growth rate is simply the percent growth divided by N, the number of years.

3.7.6 Multinomial logit regression method

Multinomial logistic regression is used to predict categorical placement in or the probability of category membership on a dependent variable based on multiple independent variables. The independent variables can be either dichotomous (i.e., binary) or continuous (i.e., interval or ratio in scale). Multinomial logistic regression is a simple extension of binary logistic regression that allows for more than two categories of the dependent or outcome variable. Like binary logistic regression, multinomial logistic regression uses maximum likelihood estimation to evaluate the probability of categorical membership.

3.7.7 Rank Based Quotient

Rank Based Quotient (RBQ) was calculated on the basis of rank assigned by each farmer against to prioritize the advantages and constraints in the crop and dairy farming prevailing in the study area by using following formula-

$$RBQ = \sum_{i=1}^{n} \frac{fi\,(n+1-i)}{N \times n} \times 100$$

Where,

fi = Frequency of farmers for the i^{th} rank of the attribute

N = Total number of farmers contacted

n = Total number of ranks

i = Rank of the attributes

CHAPTER – 4

RESULTS & DISCUSSION

RESULTS AND DISCUSSION

This chapter deals with the findings of the present study which are presented and discussed under following sub-heads:

4.1 Socio-personal profile
4.2 Socio-economic variables
4.3 Land selling pattern of respondents
4.4 Change in livelihood pattern
4.5 Factors affecting livelihood pattern
4.6 Change in animal and cropping pattern
4.7 Advantages in peri-urban dairy and crop production
4.8 Constraints in peri-urban dairy and crop production
4.9 Prospects of peri-urban dairy and crop production

4.1 SOCIO-PERSONAL PROFILE

4.1.1 Distribution of respondents based on age

Category (in years)	Sold[1]		Unsold[2]		Total	
	Respondents (n=93)		Respondents (n=67)		Respondents (N=160)	
	F	%	F	%	F	%
Young (upto 35)	18	19.4	11	16.4	29	18.2
Middle (36-50)	39	41.9	28	41.8	67	41.8
Old (>50)	36	38.7	28	41.8	64	40

The pooled (N=160) data presented in table- 4.1.1 revealed that 41.8 per cent (41.9 % and 41.8 % in case of sold and unsold category respectively) of the respondents belonged to middle age group (36-50 years). Further it was found that 38.7 per cent and 41.8 per cent respondent's belonged to old category in case of sold and unsold respondents respectively. In case of sold category as

[1] Sold category – out of 160 respondents from the sample, 93 respondents (58.1%) sold their farm land partially or completely (the respondents who sold their farm land completely was only 6.4% out of 93 sold respondents but all had purchased land again and involved in agriculture so, these respondents included in sold category for better analysis as sample for completely sold was too small)

[2] Unsold category- Respondents who retained farm land fully without any sale

compared to unsold category, the young age group (upto 35) were more about 3 per cent. These was mainly because of most of the young age group disposed their farm land either partially or fully. However, it is very difficult to attribute the level of age as a factor as economic compulsions might have tempted the respondents to sell their land.

4.1.2 Distribution of respondents based on Caste

Category	Sold		Unsold		Total	
	Respondents (n=93)		Respondents (n=67)		Respondents (N=160)	
	F	%	F	%	F	%
Gen	5	5.4	9	13.4	14	8.7
OBC	65	69.9	50	74.7	115	71.9
SC/ST	23	24.7	8	11.9	31	19.4

Based on the caste, the respondents were classified and it has been found that majority (71.9%) of the respondents belonged to OBC (other backward class) category in total, where it was 69.9 per cent in case of sold and 74.7 per cent in case of unsold respondents followed by SC/ST and General category and the same data has been presented in table 4.1.2 it was observed from the table that in sold category SC/ST caste respondents were more as compare to unsold category. This indicates that majority of the economically and socially backward class sold their land

4.1.3 Distribution of respondents based on sex

Category	Sold		Unsold		Total	
	Respondents (n=93)		Respondents (n=67)		Respondents (N=160)	
	F	%	F	%	F	%
Male	78	83.9	54	80.6	132	82.5
Female	15	16.1	13	19.4	28	17.5

The respondents of the present study as categorised based on their sex, revealed that in total 82.5 per cent of the interviewed respondents were the male only in case of both the sold (83.9%) and unsold (80.6%) category.

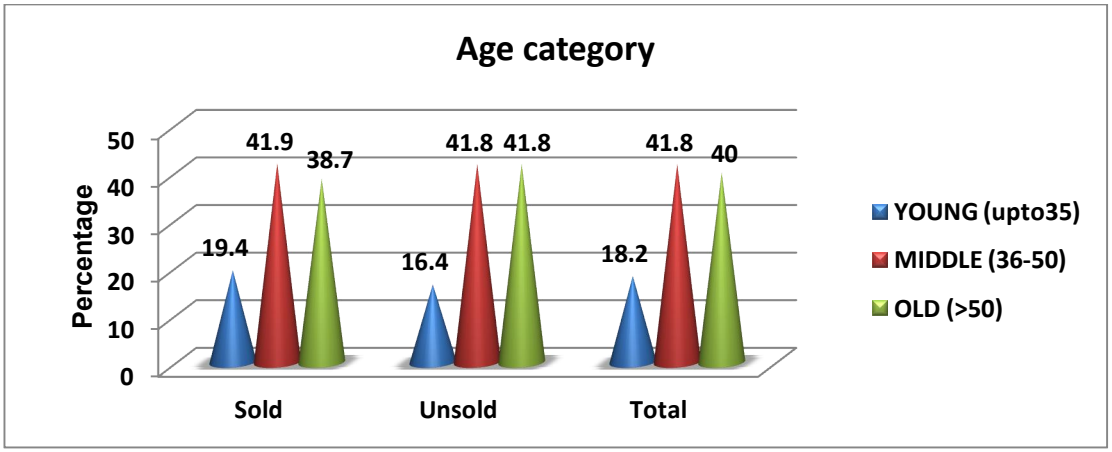


Fig. 4.1 Distribution of respondents based on age

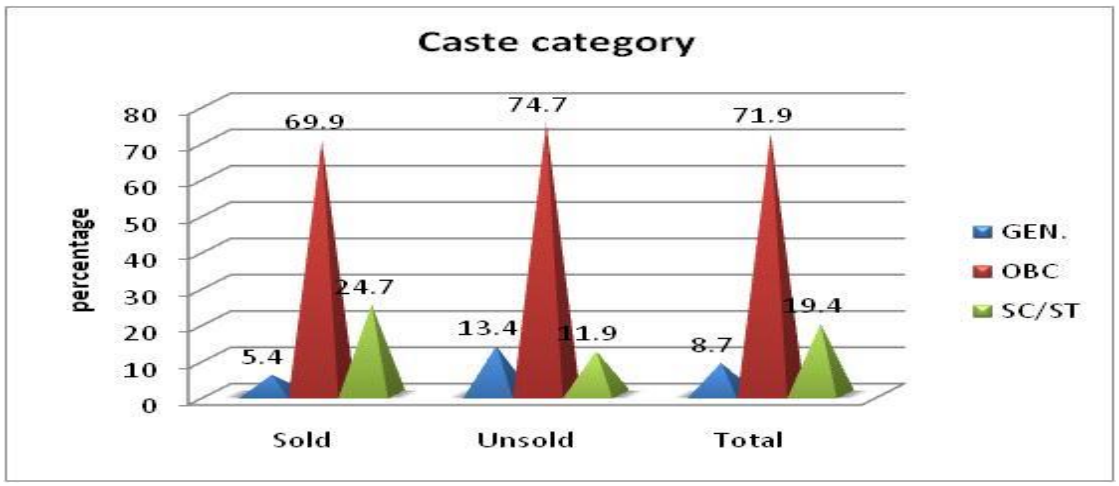


Fig. 4.2 Distribution of respondents based on caste

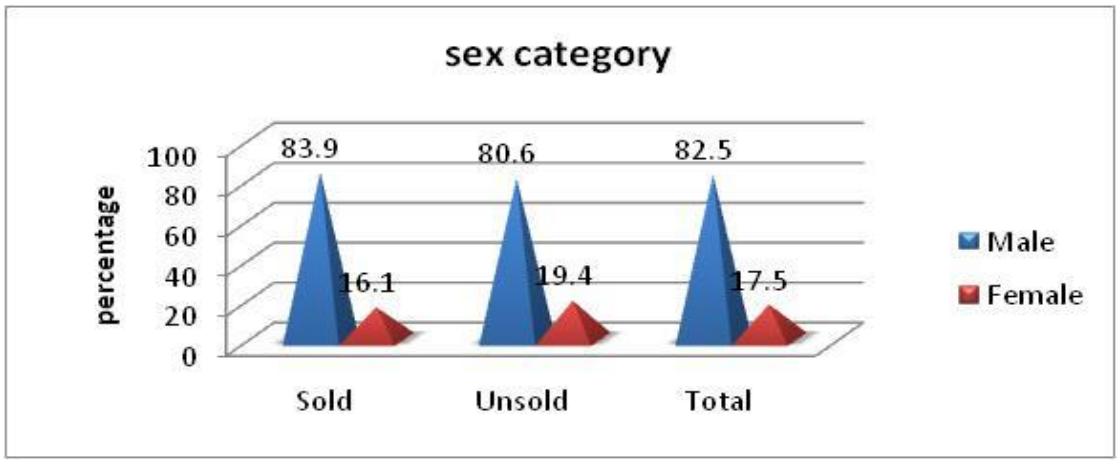


Fig. 4.3 Distribution of respondents based on sex

Majority of respondents were males, due to gender constraints in society as females were not ready to come out and willing to give information to the outsiders. However, in peri-urban area female respondents (17.5%) gave better response mainly due to influence of urban environment.

4.1.4 Distribution of respondents based on their educational level

Category	Sold		Unsold		Total	
	Respondents (n=93)		Respondents (n=67)		Respondents (N=160)	
	F	%	F	%	F	%
Illiterate (0)	19	20.4	16	23.9	35	21.9
Primary (1)	23	24.7	15	22.4	38	23.7
Matriculate (2)	27	29.1	23	34.3	50	31.3
Intermediate (3)	15	16.1	10	14.9	25	15.6
Graduate and above (4)	9	9.7	3	4.5	12	7.5

The table 4.1.4 reveals that 29.1 per cent and 34.3 per cent respondents in case of sold and unsold category respectively were educated upto matriculation level followed by 24.7 per cent in case of sold category and 22.4 per cent unsold were literate up to primary level. It was also found that 21.9 per cent of the respondents were illiterate in the study area while in unsold category maximum numbers of illiterates were found (23.9%). As compared to unsold category the sold category respondents belonged to more graduate and above level of education (9.7%). It could be construed that illiterate respondents were in substantial numbers who could not be able to take prudent decisions and were forced to find employment wherever it was possible to get the same.

4.1.5 Distribution of respondents based on family type

Category	Sold		Unsold		Total	
	Respondents (n=93)		Respondents (n=67)		Respondents (N=160)	
	F	%	F	%	F	%
Nuclear	71	76.4	58	86.6	129	80.6
Joint family	22	23.6	9	13.4	31	19.4

According to the classification based on the family type, it has been found that in total respondent's majority (80.6%) of the respondent's belonged to nuclear family; and only 19.4 per cent of the respondents were having joint family. In case of sold category the joint family were about 23.6 per cent as compared to unsold category (13.%). This is the prevailing trend to prefer nuclear family due to urban influence.

4.1.6 Distribution of respondents based on family size

Category	Sold		Unsold		Total	
	Respondents (n=93)		Respondents (n=67)		Respondents (N=160)	
	F	%	F	%	F	%
Small (<5 members)	39	41.9	30	44.8	69	43.2
Medium (5-8 members)	43	46.3	31	46.3	74	46.2
Large (>8 members)	11	11.8	6	8.9	17	10.6

The table 4.1.6 reveals that 46.3 per cent respondents belonged to medium category (5-8 family members) in case of both sold and unsold category of the respondents. It has also been found that in total category, one-tenth of respondents belonged to large family size (>8 members).

4.2 SOCIO-ECONOMIC VARIABLES

4.2.1 Classification of respondents according to their Land holding

Category	Sold		Unsold		Total	
	Respondents (n=93)		Respondents (n=67)		Respondents (N=160)	
	F	%	F	%	F	%
Marginal (upto1 ha)	52	55.9	25	37.3	77	48.2
Small (1-2 ha)	18	19.4	23	34.3	41	25.6
Semi-medium (2-4 ha)	13	14	15	22.4	28	17.5
Medium (4-10 ha)	6	6.4	4	6	10	6.2
Large (above 10 ha)	4	4.3	0	0	4	2.5

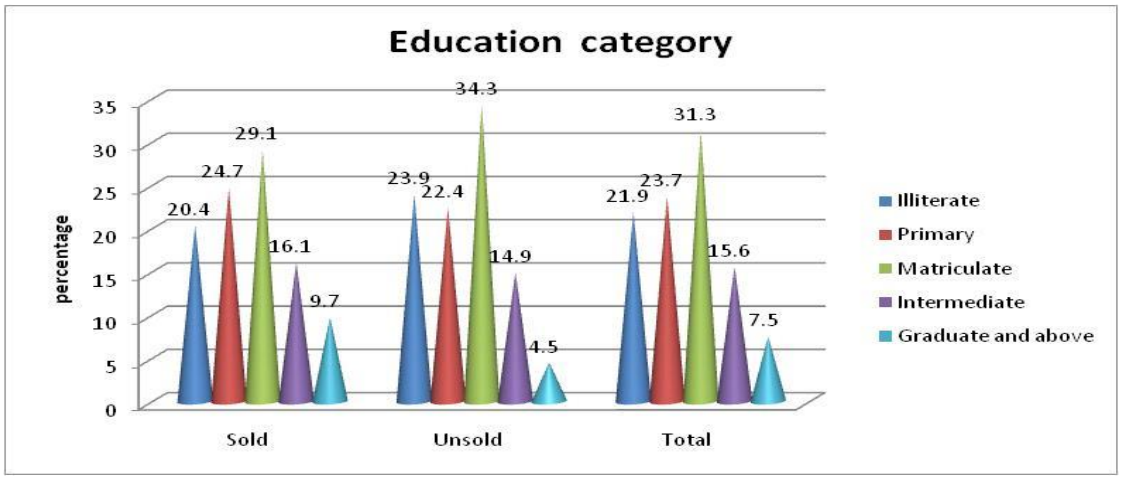


Fig. 4.4 Distribution of respondents based on their educational level

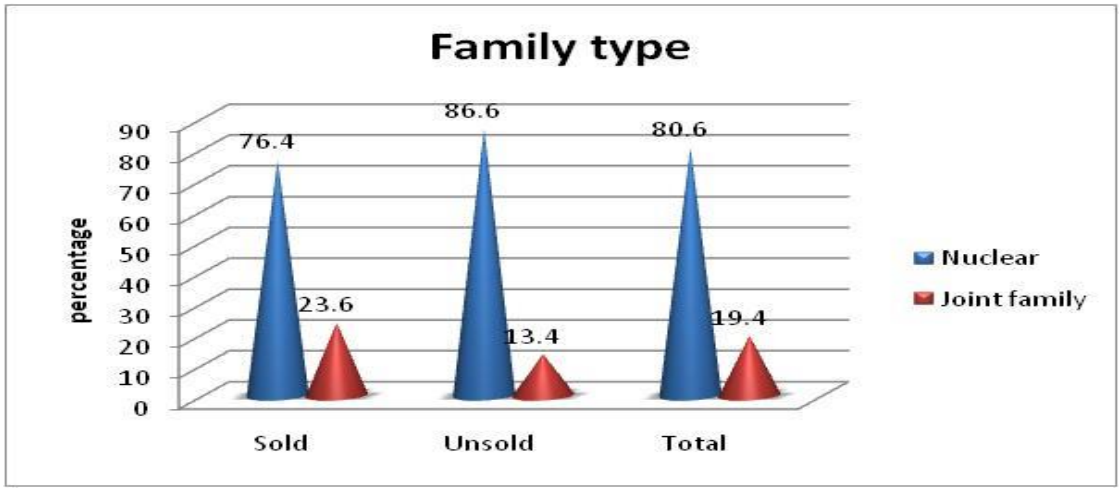


Fig. 4.5 Distribution of respondents based on their family type

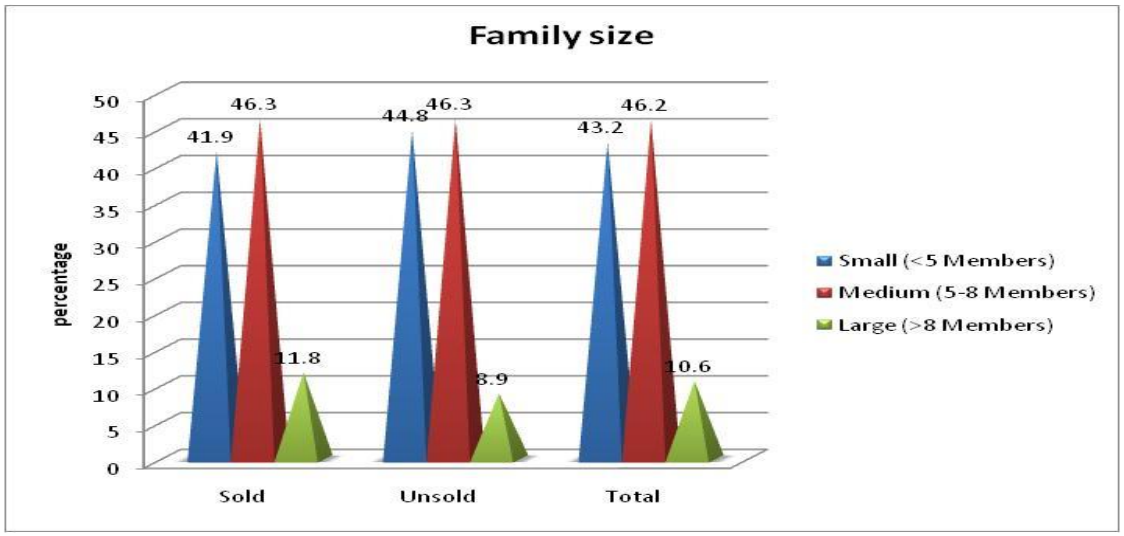


Fig. 4.6 Distribution of respondents on based on their family size

According to land holding of the respondents, it has been found that in total 48.2 per cent of the respondents in the study area belonged to marginal category who possessed land upto one hectare followed by 25.6 per cent of the respondents under small farmers category. The study has also further found out that only 2.5 per cent of the respondents in the study area had more than 10 ha land size. In case of sold category, more than half of respondent belonged to marginal land holding category as compared to unsold. In fact, many of the resource poor farmers who could not understand the dynamics of real estate business sold their land according to their prevailing economic conditions. Majority of respondents in sold category (55.9%) belonged to marginal land holding as compared to unsold category (37.3%). This might be due to the fact that after selling land partially or completely, majority of sold category respondents fell under marginalized land holding (below 1 ha). This will also limit them to go for crop production due to insufficient availability of land.

4.2.2 Distribution of respondents based on Annual Income

Category	Sold		Unsold		Total	
	Respondents (n=93)		Respondents (n=67)		Respondents (N=160)	
	F	%	F	%	F	%
Low (<50000 rupees)	11	11.8	13	19.4	28	17.6
Medium(50000 to 420000)	72	77.4	48	71.6	118	73.7
High(>420000)	10	10.8	6	9.0	14	8.7

The data pertaining to annual income of the respondents revealed that majority (77.4%) of the respondents belonged to medium category i.e. they had Rs.5000 to 420000 of annual income followed by 17.5 per cent respondents in low income category, with less than Rs.50000 of earning per year. The unsold category respondents in low income group were high (19.4) as compared to sold category respondents. This might be mainly due to the involvement of sold category in diversified livelihood options to earn their living, whereas in case of

unsold category majority of respondents were dependent on the limited sources of income.

4.2.3 Distribution of respondents on the basis of family education status

Category	Sold		Unsold		Total	
	Respondents (n=93)		Respondents (n=67)		Respondents (N=160)	
	F	%	F	%	F	%
Low (<1.1)	27	29.0	33	49.2	58	36.2
medium (1.1 to 2)	41	44.1	29	43.3	70	43.8
High (>2)	25	26.9	5	7.5	32	20

The data pertaining to family education status disclosed that in total, 43.8 per cent respondents belonged to medium category who possessed family education score between 1.1 to 2 (44.1% and 43.3% in case of sold and unsold category respectively), followed by 36.2 per cent of the respondents with low family education status (less than 1.1) and 20 per cent of the respondents with high family education status. As compared to unsold category majority of respondents in sold category (44.1%) fell under medium family education status thus showing that sold category seemed to be possessed better family education status as compared to unsold category. The data indicated that the educated families who sold their land could have diversified their livelihood occupations and might have invested substantially in their children's education.

4.3 Land selling pattern of respondents

4.3.1 Distribution of respondents based on farm land sold

Category	Respondents (N=160)	
	Frequency	Percentage
Sold	93	58.1
Unsold	67	41.9

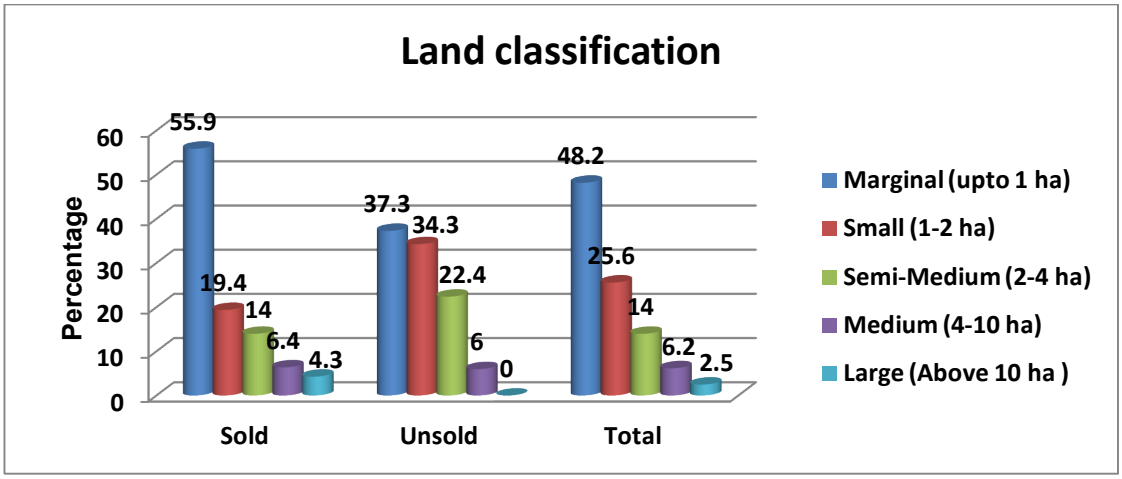


Fig. 4.7 Distribution of respondents according to their land holding

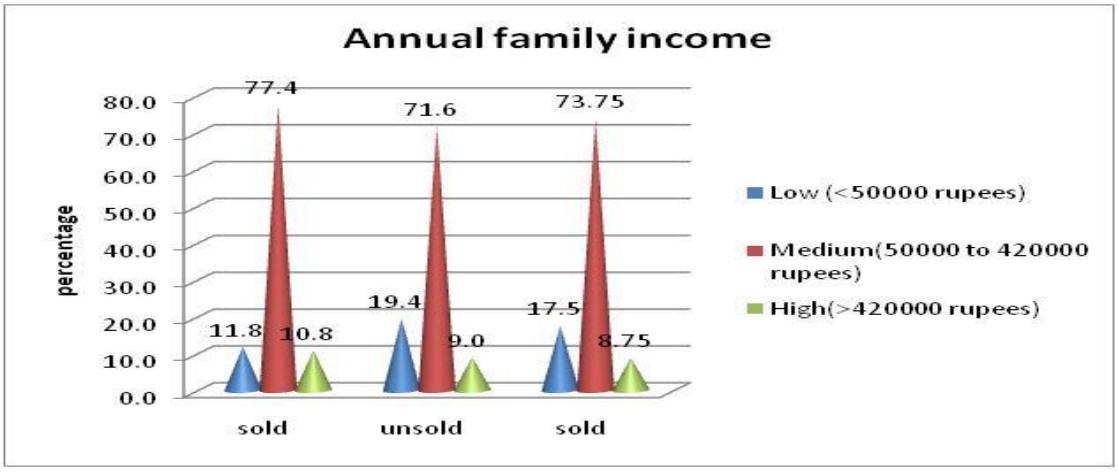


Fig. 4.8 Distribution of respondents based on their annual income

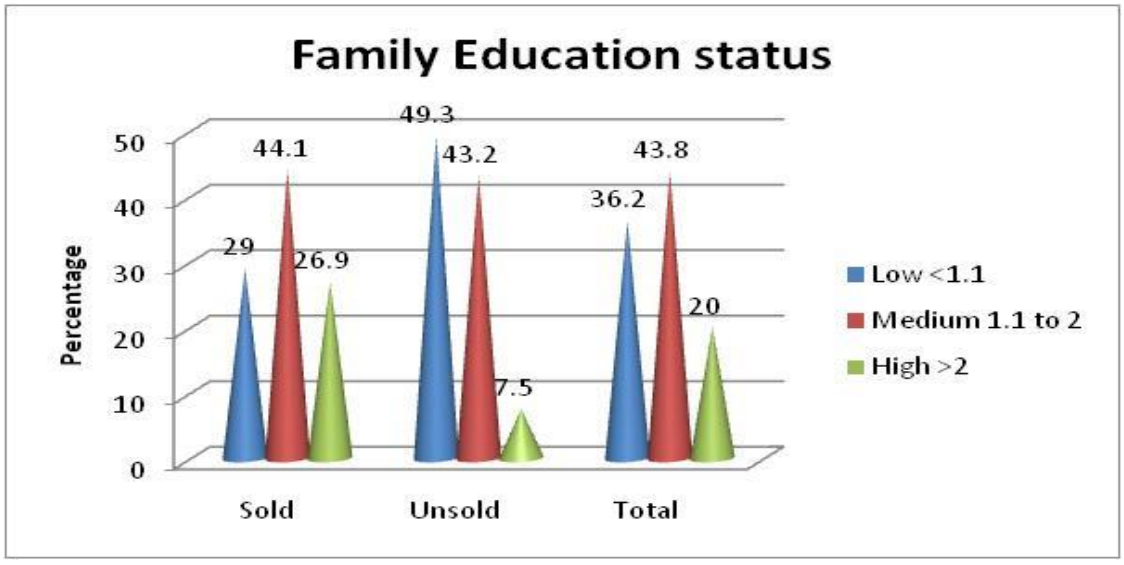


Fig. 4.9 Distribution of respondents based on their family education status

It is apparent from the table 4.3.1 that out of 160 respondents, 93 respondents (58.1%) sold their farm land partially or completely (the respondents who sold their land completely was only 6.4 % respondents out of 93 sold respondents but all had purchased land again in areas where land was costlier and got involved in agriculture so, these respondents included in sold category for better analysis as sample for completely sold was too small). Fazal (2000), Rees (1992), Tokuda(1993), Nguyen (2009), Quasem (2011) reported findings on farm land sold/conversion in their studies.

4.3.2 Distribution of sold category respondents based on quantum of farm land sold

Land selling pattern	Total sold respondents (n=93)	
	Frequency	Percentage
Partially sold	87	93.6
Completely sold	6	6.4

Table 4.3.2 shows that, out of 93 respondents of sold category more than half of the respondents partially sold their land and about 6.4 per cent of the respondents sold their land completely. In case of sold category, those six respondents who sold their land completely again purchased land and continued in agriculture therefore those respondents were considered for the study as a sold category with partially sold group. During the interview farmers expressed that majority of people who sold their land completely some had migrated to city along with family and involved in non-agriculture activates and few migrated to the nearby rural area (Because especially in rural areas where land cost was very low the people who sold their land in peri-urban areas moved towards rural areas again for starting farming by purchasing land with money obtained from land sold).

4.3.3 Distribution of sold respondents based on land sold to different categories of buyers

To whom land was sold	Respondents (n=93)			
	Real estate	Government	Neighbours	Total
Frequency	66	20	7	93
Percentage	71.0	21.5	7.5	100
Total hectare sold	50.5	16.6	2.6	69.7

Base year taken was 2000 and data gathered upto 2014

It is apparent from the table 4.3.3 that out 93 respondents of sold category nearly three-fifth (71.00%) of the farmers had sold their land (50.5 ha) to real estate owners, while nearly one-fifth (21.50%) of them sold to Government (Government acquisitions) and 7.50 per cent of them sold to neighbours. it was further evident from the table that 93 respondents in the sold category sold 67.7 hectare of land to the different buyers in which 50.5 hectare of land was sold to real estate buyers and about 16.6 hectare of land was acquired by government (sold to government) and about 2.6 hectare land sold to neighbours. It was clearly observed from the table that in peri-urban areas real estate activities are booming at very high rate and they converted farm land into sites for making higher profit.

4.3.4 Distribution of money utilization pattern of respondents after selling their land

Money utilization pattern	Respondents (n=93)	
	Frequency*	Percentage
Marriage	27	29.0
Bike	29	31.2
Car	25	26.9
House	80	86.0
Land	22	23.7
Deposited in bank	26	28.0
Business	13	14.0
Agriculture implements	13	14.0
personal use	26	28.0
Miscellaneous	56	60.2

*Multiple responses counted

Fig. 4.10 Distribution of respondents based on their farm land sold

Fig. 4.11 Distribution of respondents based on their farm land sold to different categories of buyers

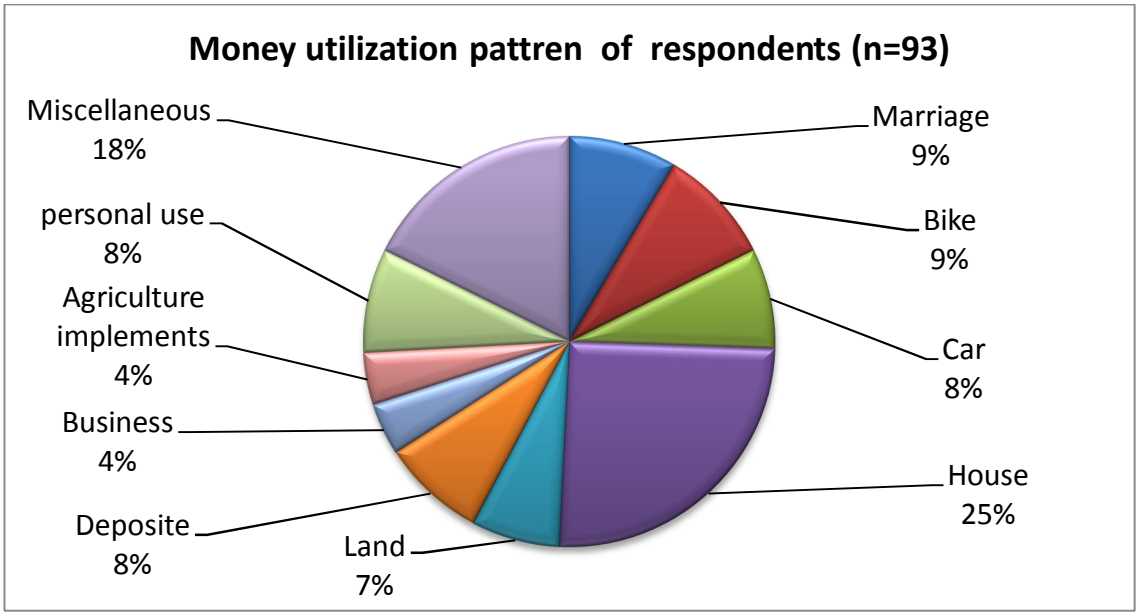


Fig. 4.12 Distribution of money utilization pattern of respondents after selling their land

Farmers after receiving the money obtained by selling the land, majority (86.00 %) of the them utilised the money for house construction because possessing a good house in peri-urban villages was considered to be the matter of status whether farmers belonged to marginal farmer or a agriculture labour, Nearly 60.20 per cent of them used money for miscellaneous purpose including investment in children's education, tube well erection, establishing poultry farm, purchase of heavy vehicles etc. About 31.20 per cent of them for purchasing bikes, 29.00 per cent of them used for marriage functions, while each 28.00 per cent of them used for depositing in bank and for personal use which includes family expenditure, personal expenditure etc. 26.90 per cent of them used for purchasing cars, 23.70 per cent of them utilised to purchase land and each 14.00 per cent of them used for purchasing agriculture implements and for business purposes. Farmers invested their money as per the prevailing status consciousness and socio-economic compulsions.

4.3.5 Distribution of respondents as per their intention to sell their farm land in future

Response of farmer	Respondents (N=160)	
	Frequency	Percentage
Intending to sell the land	42	26.3
Not to sell the land	89	55.6
Can't say now	29	18.1

With respect to the selling land in the near future table 4.3.5 depicted that most of the respondents (55.6%) expressed that they decided not to sell the land in the future reasoning that land was most valuable asset and owning the land in the near city could reveal their richness and also they become urban conscious and hoping that in near future their land cost is likely to escalate. But, 26.3 per cent of respondents showed willingness to sell land in future which indicated that, there is a trend of selling land among peri-urban farmers and also 18.1 per cent respondents were uncertain about to sell their land which showed that these farmers lacked certain crucial information for making better decisions.

4.4 Change in livelihood pattern

4.4.1 Distribution of respondents based on their major livelihood options

Livelihood options	Sold		Unsold		Total	
	Respondents (n=93)		Respondents (n=67)		Respondents (N=160)	
	F	%	F	%	F	%
Crop production	38	40.9	36	53.7	74	46.3
Dairy farming	14	15.1	7	10.4	21	13.1
Sericulture	6	6.5	3	4.5	9	5.6
Commercial poultry farming	2	2.2	1	1.5	2	1.3
Agriculture labour	4	4.3	4	6.0	8	5.0
Artisan /craftsmen	0	0.0	4	6.0	4	2.5
Small scale business	9	9.7	6	9.0	15	9.4
Manual worker in industry	5	5.4	3	4.5	8	5.0
Real estate activity	3	3.2	0	0.0	3	1.9
Govt /Private job	6	6.5	2	3.0	8	5.0
Other	6	6.5	1	1.5	8	5.0

With respect to livelihood option, it could be observed that in sold category majority of the respondents (40.9%) had crop production as the main occupation, while in the unsold category it was 53 per cent which is more than that of sold category. In pooled (total) category 9.4 per cent respondents were doing business. Overall in case of sold category as compare to the of the unsold category the respondents are involved in the non- agriculture activities this is mainly because of the decrease in the land size of respondent make them to divert towards non-agriculture activities like small scale business, manual worker in industry, real estate activity, Govt/private job and others (electricians, mechanical worker, drivers etc.). Hillyer *et al.* (2001) revealed similar results from his study on peri-urban area of Hubli and Dharwad in Karnataka.

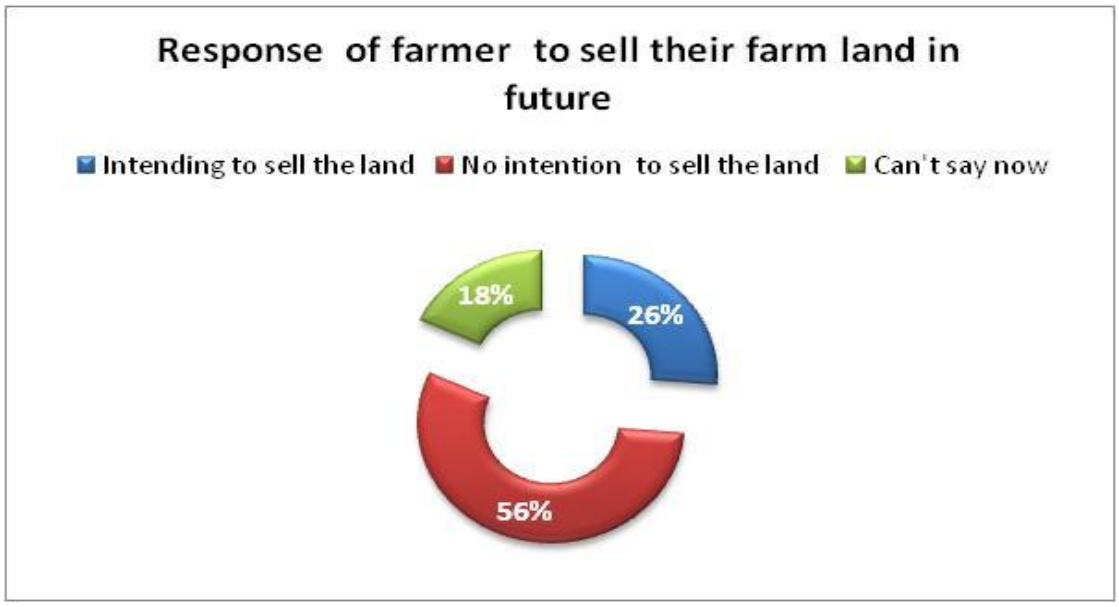


Fig. 4.13 Distribution of respondents as per their intension to sell farm land in future

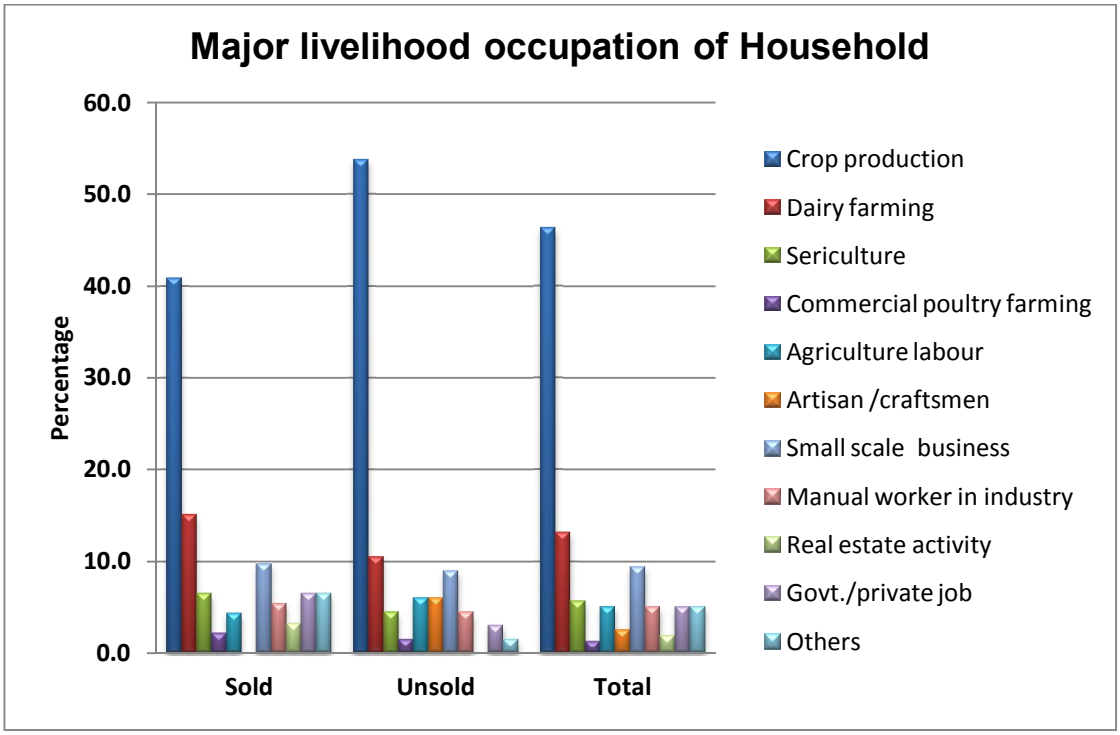


Fig. 4.14 Distribution of respondents based on their major livelihood options

4.4.2 Distribution of respondent based on their subsidiary livelihood options in the family

Subsidiary livelihood occupation	Sold		Unsold		Total	
	Respondents (n=93)		Respondents (n=67)		Respondents (N=160)	
	F	%	F	%	F	%
Crop production	19	20.4	3	4.5	22	13.8
Dairy farming	17	18.3	20	29.9	37	23.1
Crop+dairy	9	9.7	6	9.0	15	9.4
Crop+Small scale Business	0	0.0	4	6.0	4	2.5
Dairy+Manual worker in industry	1	1.1	5	7.5	6	3.8
Agriculture labour	2	2.2	1	1.5	3	1.9
Govt/private job	6	6.5	2	3.0	8	5.0
Others*	5	5.4	4	6.0	9	5.6
Combined activities **	20	21.5	7	10.4	27	16.9
No subsidiary occupation***	14	15.1	15	22.4	29	18.1

*Others includes single livelihood option other than above (table 4.4.2) mentioned single options viz., Small scale business, Mechanical worker, Driver, Manual worker in industry, Sericulture etc.

** Combined activity includes the combination of two or more activities other than the above mentioned (table 4.4.2) combination viz., Dairy+Real estate activity, Sericulture+Dairy, Dairy+Manual labour in industry+Real estate activity, Crop+Business+ Others, Dairy+Govt/Private job etc.

*** Respondents not having any subsidiary occupation, they dependent on only single major occupation for their livelihood.

The table 4.4.2 clearly shows that majority of respondents belonged to sold category practising crop production as their subsidiary livelihood option (20.40%), while same was about 4.50 per cent in unsold category. It shows that after selling land majority of farmers were taking crop production as their subsidiary source of livelihood rather than major source due to scarcity of land for cultivation. For unsold farmers in combined activities could be found among land sold farmers (21.50%) than unsold farmers (10.40%). More than one-fourth (29.90%) of the unsold farmers and 18.30 per cent of the sold farmers had dairy

farming as their subsidiary occupation. Dairy & Manual worker in industry (7.50%) and Crop & Small scale business (6.00%) was subsidiary livelihood amongst unsold farmers.

4.4.3 Distribution of respondent based on the combination of household livelihood occupation

Present livelihood occupation	Sold		Unsold		Total	
	Respondents (n=93)		Respondents (n=67)		Respondents (N=160)	
	F	%	F	%	F	%
Crop production	3	3.2	5	7.5	8	5
Crop+Dairy	21	22.6	21	31.3	42	26.3
Crop+Allied agriculture activity	2	2.2	2	3.0	4	2.5
Crop+ Dairy+Allied agriculture activity	9	9.7	7	10.4	16	10
Crop+Allied non-agriculture activity	16	17.2	2	3.0	18	11.3
Crop+Dairy+Allied non-agriculture activity	18	19.4	15	22.4	33	20.6
Dairy+ Non-allied activity	7	7.5	0	0.0	7	4.4
Allied agriculture activity	4	4.3	4	6.0	8	5
Allied non- agriculture activity	13	14.0	11	16.4	24	15

Note: Allied agriculture activity includes- Commercial poultry farming, Sericulture, Agriculture labour. Allied non-agriculture activity includes – Business, Manual labour in industry, Govet/private job, Mechanic, Driver, etc.

It can be found that ‘Crop+Dairy’ was the major present livelihood occupation pattern followed by both unsold (31.30%) and sold farmers (22.60%), next tracked by ‘Crop+Dairy+Allied non-agriculture activity’ by 22.40 per cent of unsold and 19.40 per cent of sold farmers. While ‘Non-allied agricultural activity’ pattern was almost same for unsold (22.40%) and sold farmers (19.40%). ‘Crop+Dairy+Allied non-agriculture activity’ was the current model followed by 17.20 per cent of sold farmers and only few about 3.00 per cent of unsold farmers. This shows that majority of farmers who sold their land partially were following dairy + non-agriculture activity as their livelihood options. ‘Crop+Dairy+Allied agriculture activity’ pattern was observed with 10.40 per cent

of unsold farmers and 9.70 per cent by sold farmers. In case of sold category Dairy+Non-allied agriculture activity was more (7.5%) in case unsold this combination was zero per cent because of non- availability of land with sold category restrict them from crop farming. Allied agriculture activities were more in unsold category (6%) then in sold category (4.3%). Other than the above major combinations there are different combinations present in the both categories as mentioned above.

4.4.4 Distribution of respondent based on addition of new livelihood options from 2000 to 2014

New livelihood options added	Sold		Unsold		Total	
	Respondents (n=93)		Respondents (n=67)		Respondents (N=160)	
	F	%	F	%	F	%
Crop production	2	2.2	0	0	2	1.3
Dairy farming	1	1.1	0	0	1	0.6
Sericulture	0	0.0	0	0	0	0
Commercial poultry farming	4	4.3	0	0	4	2.5
Agriculture labour	1	1.1	0	0	1	0.6
Artisan /craftsmen	0	0.0	1	1.5	1	0.6
Small scale business	16	17.2	10	14.9	26	16.3
Manual worker in industry	8	8.6	8	11.9	16	10.0
Real estate activity	2	2.2	3	4.5	5	3.1
Govt/ private job	17	18.3	6	9.0	23	14.4
Other	15	16.1	5	7.5	20	12.5
No occupation added	32	34.4	37	55.2	69	43.1

It can be depicted from table that since the year 2000 to 2015, small scale business was further added as a livelihood source of income by sold (17.20%) and unsold farmers (14.90%) while Govt/private job was also added along with manual worker in industry by sold (18.30% & 8.60% respectively) and unsold farmers (9.00% & 11.90% respectively). It was evident from the table 4.4.4 that a wide variety of livelihood option was chosen by the respondents family from 2000 to 2014. In case of sold category, 4.3 per cent of respondents invested in

commercial poultry farming. This was mainly due to money obtained from the sale of farm land. Some farmers invested in poultry farming due to availability of urban market in nearby city. However, it was clearly evident from the table 4.4.4 that majority of peri-urban respondents were diverted towards high income oriented agricultural activities and non-farm activities like business, manual worker in industry and Govt/private jobs.

4.4.5 Distribution of respondent based discontinued livelihood option during 2000 to 2014

Occupation left	Sold		Unsold		Total	
	Respondents (n=93)		Respondents (n=67)		Respondents (N=160)	
	F	%	F	%	F	%
Crop production	16	17.2	5	7.5	21	13.1
Dairy farming	20	21.5	1	1.5	21	13.1
Sericulture	3	3.2	1	1.5	4	2.5
Agriculture labour	8	8.6	7	10.4	15	9.4
Small scale business	1	1.1	0	0.0	1	0.6
No occupation left	54	58.1	46	68.7	100	62.5

From the table it was observed that among sold respondents who have left the crop and dairy farming were 17.20 per cent and 21.50 per cent respectively as livelihood occupations while it was less among unsold respondents about 7.50 per cent and 1.5 per cent respectively. About 10.40 per cent of the unsold respondents left agriculture labour and 8.60 per cent by sold respondents. Of all the selected respondents, 68.70 per cent continued the occupation among unsold respondents and 58.10 per cent in sold respondents. It was observed that about 9.4 per cent of total respondents left agriculture labour which might have led to scarcity of labour for farm activities in peri-urban area of Bengaluru. Similar result was reflected in constraint portion of peri-urban crop production in table 4.8.2. Singh and Shruti (2014) disclosed the similar results in their study on depeasantization in Punjab.

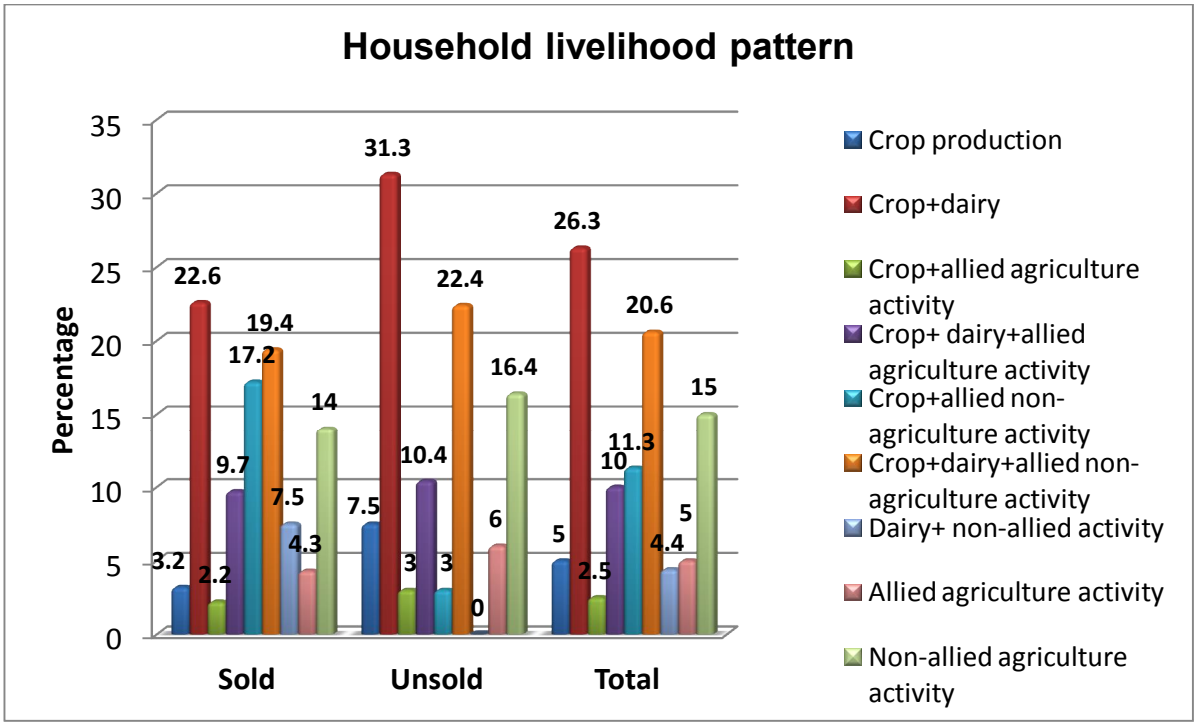


Fig. 4.15 Distribution of respondent based on their combined household livelihood pattern

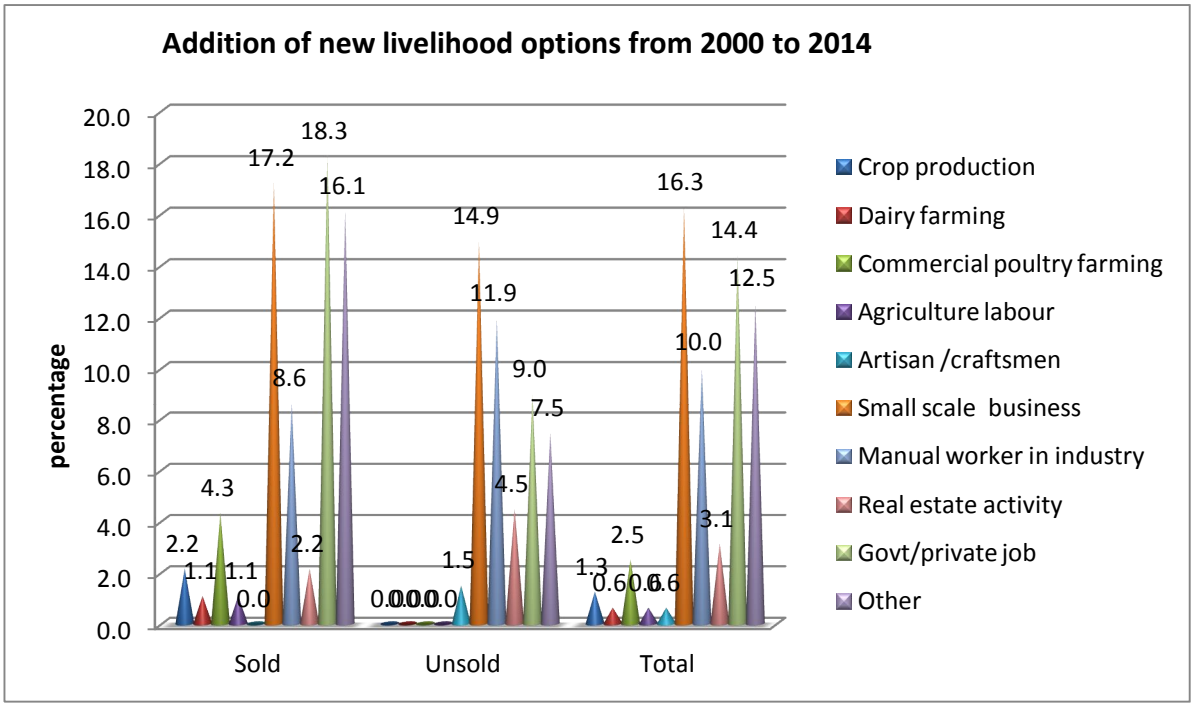


Fig. 4.16 Distribution of respondents based on addition of new livelihood options from 2000 to 2014

4.5 Factors affecting livelihood pattern

4.5.1 Multinomial logistic regression method to analyse the factors influencing the change in livelihood of the respondents

Multinomial logistic regression is used to predict categorical placement in or the probability of category membership on a dependent variable based on multiple independent variables.

Table 4.5.1 Factors influencing the effect of urbanisation on livelihood of the farmers

Livelihood diversification pattern Reference category= Crop+Dairy		B	Std. Error	Wald	Sig.	Exp(B) or Odds Ratio
Agriculture and allied activities	Intercept	-.550	1.261	.190	.663	
	Age	-.025	.025	1.019	.313	.976
	Land holding	.061	.099	.388	.533	1.063
	Family labour migration	3.347	.726	21.240	.000***	28.416
	Total Land sold (Acre)	.390	.289	1.826	.177	1.478
	Total income	.000	.000	1.671	.196	1.000
	Herd size	-.290	.137	4.476	.034**	.749
	Total Monthly Family Expenditure	.000	.000	1.261	.262	1.000
	[Education, illiterate =0, literate=1]	.333	.864	.148	.700	1.395
	Land selling pattern [Land not sold=.0, Land sold=1]	.227	.642	.126	.723	1.255
Agriculture and allied non-agriculture activities	Intercept	-1.335	1.208	1.221	.269	
	Age	-.009	.021	.162	.688	.991
	Land holding	-.043	.096	.201	.654	.958
	Family labour migration	3.458	.715	23.379	.000***	31.768

	Total Land sold (Acre)	.058	.284	.041	.839	1.060
	Total income	.000	.000	4.388	.036**	1.000
	Herd size	.045	.096	.225	.635	1.046
	Total Monthly Family Expenditure	.000	.000	.701	.402	1.000
	[Education, illiterate =0, literate=1]	-1.334	.869	2.358	.125	.263
	Land selling pattern [Land not sold=.0, Land sold=1]	.443	.562	.620	.431	1.557
Non-agricultural activities	Intercept	-.870	2.172	.160	.689	
	Age	.059	.050	1.382	.240	1.060
	Land holding	-.748	.278	7.222	.007***	.473
	Family labour migration	4.816	.948	25.788	.000***	123.474
	Total Land sold (Acre)	.417	.333	1.568	.211	1.518
	Total income	.000	.000	4.084	.043**	1.000
	Herd size	-4.487	1.922	5.450	.020**	.011
	Total Monthly Family Expenditure	.000	.000	.693	.405	1.000
	[Education, illiterate =0, literate=1]	-3.478	1.467	5.620	.018**	.031
	Land selling pattern [Land not sold=.0, Land sold=1]	-1.132	.968	1.368	.242	.322
Chi-square:203.102***						
McFadden (Pseudo R^2): 0.473						

Note: ***, ** & * indicate the significance at 1, 5 and 10 per cent level of probability.

The independent variables can be either dichotomous (i.e., binary) or continuous (i.e., interval or ratio in scale). Multinomial logistic regression is a simple extension of binary logistic regression that allows for more than two categories of the dependent or outcome variable. Like binary logistic regression, multinomial logistic regression uses maximum likelihood estimation to evaluate the probability of categorical membership (Starkweather *et al.* 2011). Estimates of the multinomial logit model indicate that fitted model is valid based on the significant Chi-square statistic (203.10). The 'beta' coefficient for family labour migration was found to be positively significant in all the three categories of livelihood options. This indicates that as the number of family labour for migration increases, the choice for livelihood options was found to be more in the case of non-agricultural activities (4.82), followed by agriculture and allied non-agriculture activities (3.46) and agriculture and allied activities (3.35) in comparison to the base category i.e. Crop+Dairy activity and other variables like age, land holdings, total land sold, total income, herd size, monthly family expenditure, education and land selling pattern remaining constant. Similarly, odds ratio for the family labour migration variable indicates the increase in terms of probability. In the present case, as the family labour migration increases, the relative probability of livelihood diversification is higher by 12247 per cent in non-agricultural activities (123.47-1 = 122.47), followed by agriculture and allied non-agriculture activities (3077%) and agriculture and allied activities (2742%) in comparison to the Crop+Dairy as a livelihood option. That shows that the family labourers in the peri-urban areas migrate towards cities for non-agricultural activities.

The 'beta' coefficient for herd size was found to be negative in the case of non-agricultural activities as well as agriculture and allied activities. This indicates that one unit increase in the herd size is associated with a 4.49 decrease in the relative log odds of choosing the non-agricultural activities in comparison to agriculture. In other words, if there is a unit decrease in the herd size, the likelihood of choosing the non-agricultural activities increases by 4.49 units followed by agriculture and allied activities (0.29) in comparison to the reference category 'Crop+Dairy'. Similarly, odds ratio with respect to the decrease in herd size shows that the relative probability of a respondent to get

engaged in a non-agricultural activity is more than the agriculture and allied activities in comparison to the reference livelihood option 'Crop+Dairy'. It was obvious that the persons engaged in the allied farm or off-farm livelihood activities could not rear more animals. The beta coefficient for land holding was negatively significant in non-agricultural activities. The marginal or landless farmers or those who have sold their land are diverted to non-agricultural activities as they are getting more off-farm jobs or business opportunities in the nearby cities.

The 'beta' coefficient for total income was found to be positively significant in the case of non-agricultural activities as well as agriculture and allied non-agriculture activities. This indicates that, as the total income increases, there was an increase in the diversification of livelihood options towards non-agricultural activities followed by agriculture and allied activities.

The multinomial logit estimate for an illiterate respondent relative to a literate is -3.48 for choosing the non-agricultural activities. This means that the literates prefer non-agricultural activities by 3.48 units higher than the illiterates given all other predictor variables in the model are held constant. In other words, literates are more likely than illiterates to prefer non-agricultural livelihood option in comparison to Crop+Dairy.

4.6 Change in animal and cropping pattern

Table 4.6.1 Change in growth rate of livestock population from census 1997 to 2012 in Bengaluru urban district

(In % increase/decrease)

District	Census	Indigenous cattle	Crossbreed cattle	Total cattle	Total Buffalo	Total livestock
		Growth rate	Growth rate	Growth rate	Growth rate	Growth rate
Bengaluru urban	1997-2003	-43.9	6.8	-14.5	-44.6	-26.3
	2003-2007	-33.6	-14.4	-19.7	-24.7	37.5
	2007-2012	-28.7	18.1	7.5	-24.9	-26.7

Source: Livestock Census, Department of Animal Husbandry & Dairying, Ministry of Agriculture

Table 4.6.1 depicted that the livestock census data for Bengaluru urban district from 1997 to 2003 revealed that total cattle population was decreased by -14.5% from 1997 to 2003 and again it was decreased by -19.7% from the period of 2003 to 2007. Report of 19th livestock census in 2012 revealed that, total cattle population was increased by 7.5%. In case of buffalo population trend was decreasing growth rate from 16th livestock census (1997) to 17th livestock census from census 1997 to 2003 the total buffalo population was decreased by -44.6 per cent again in from 17th to 18th livestock census (2003-2007), it shows that total buffalo population was decreased again by -24.7 per cent and in recent 19th livestock population again revealed that the total buffalo population was shown again decline of -24.9% in Bangalore urban district. In case of total livestock it was decreased to -26.3% from 1997 to 2003, again during inter-censal period from 2003 to 2007 the total livestock was showing positive growth rate of 37.5. Again in inter-censal livestock from 2007 to 2012, it was showing decrease in total livestock population even though the cattle population showing positive growth rate from 2007-2012. It was clear evident from the table that indigenous population shows decreasing trend in population growth rate. But, the population of crossbreed cows was increased by 18% in last census (2012) shows increase in adoption of crossbreed animals in Bengaluru urban district.

Table 4.6.2 Change in percentage growth rate of livestock population from census 1997 to 2012 in Bengaluru rural district

(In % increase/decrease)

District	Census	Indigenous cattle	Crossbreed cattle	Total cattle	Total Buffalo	Total livestock
		Growth rate	Growth rate	Growth rate	Growth rate	Growth rate
Bengaluru rural*	1997-2003	-53.6	-22.5	-45.3	-61.2	-52
	2003-2007	-80.3	-26.8	-60.1	-62.1	-49
	2007-2012	-28.0	7.1	-3.7	-15	-16.4

*Data for Bangalore rural from 1997 and 2003 census include Ramanagara district earlier it was a part of Bangalore rural separated in August 2007.

Source: Livestock Census, Department of Animal Husbandry & Dairying, Ministry of Agriculture

Table 4.6.2 revealed that the livestock census data for Bangalore rural district from 1997 to 2003 reported that in Bangalore rural district the total cattle population was decreased by -45.3 % from 1997 to 2003 and again it was decreased by -60.1% from the period of 2003 to 2007. Report from 19th livestock census (2012) revealed that again it has declined by -3.7%. In case of buffalo population trend was decreasing growth rate from 16th livestock census (1997) to 19th livestock census by -61.2% (1997-2003), -62.1% (2003-2007) and -15% decline from 2007 to 2012. In case of total livestock population it was showing decreasing rate in all inter-censal period from 1997 to 2012 livestock census. But, the population of crossbreed cows was increased by 7.1% in last census (2012) shows increasing trend in adoption of crossbreed animals by farmers in Bengaluru rural district.

Table 4.6.3 Change in the total area of major crops of Bangalore urban district from census 2000-01 to 2013-14

(Area in 000' ha.)

Year	2000-01	2005-06	2010-11	2013-14
Crops	Area	Area	Area	Area
Cereals	56.5	40.8	26.9	26.6
Pulses	11.1	6.6	4.1	3.1
Oilseeds	3	1.9	1.2	0.5
Vegetables	10.2	7.7	4.1	4.8
Fruits	6.3	4.8	4.4	4.4
Commercial Flowers	2.2	NA	1.1	2.8

Note : NA-Non- available

Source: Directorate of Economics and Statistics, Bengaluru

It was evident from the table 4.6.3 shows that area under cereals, pulses and oilseeds were in decreasing trend from 2000-01 to 2013-14. From the table 4.6.4 about 29.8 thousand hectares of area under cereals, 8.0 thousand hectares of area under pulses, 2.5 thousand hectares under oilseeds, 9.4 thousand hectares under vegetables and 1.9 thousand hectare under fruit crops were decreased from 2000-01 to 2013-14. But the area under commercial crops was showing positive trend. It was increased by 0.6 thousand hectare from 2000-01 to 2013-14.

Table 4.6.4 Change in the total area under major crops of Bangalore rural district from census 2000-01 to 2013-14

(Area in 000' ha.)

Year	2000-01*	2005-06*	2010-11	2013-14
Crops	Area	Area	Area	Area
Cereals	227.4	160.5	56.3	52.2
Pulses	37.8	26.9	8.3	3.3
Oilseeds	29.4	24.2	2.1	0.5
Vegetables	20.7	8.7	9.3	1.2
Fruits	28.7	27.9	13.3	12.6
Commercial Flowers	1.4	NA	1.2	4.6

Note: *Data for Bengaluru rural from 1997 and 2003 census include Ramanagara district earlier it was a part of Bengaluru rural and later separated in August 2007.

Source: Directorate of Economics and Statistics, Bengaluru

From the table 4.6.4 it was observed that about 175.2 thousand hectares of area under cereals, 34.5 thousand hectares of area under pulses, 28.9 thousand hectares under oilseeds, 19.5 thousand hectares under vegetables and 16.2 thousand hectare under fruit crops were decreased from 2000-01 to 2013-14. But the area under commercial crops was showing increasing trend. It was increased by 3.3 thousand hectares from 2000-01 to 2013-14 in Bengalore rural district. The fig 4.19 shows the trend in change of area under various crops in Bangalore rural district. The main reason for this is the establishment of Kempegowda international airport in peri-urban area of Bengaluru (Devanahalli taluk of Bangalore rural district) and also displacement of many villages in the peri-urban leads to the area under the different crops and also due to establishment of airport the land price was hiked leads to selling of land by the farmers to the real estate companies was booming and also land acquisition by government leads to conversion of agriculture land to non-agriculture uses is also a important reason for decrease in area under major crops in Bangalore rural district .

Table 4.6.5 Change in livestock holding of respondents from 2000 to 2014

(Animals in number)

Year		2000	2005	2010	2014
Cattle	Indigenous	107	24	17	9
	Crossbreds	303	268	198	191
Buffalo		183	117	98	110
Other		235	89	78	85
Total		828	498	391	395

Source: Primary data collected from respondents

From the table 4.6.5 it is evident that the livestock population of the respondents had decreased during the period from 2000 to 2014. Out of 160 respondents interviewed the Indigenous cattle population of respondents had decreased by -95 per cent (from 107 to 9 animals). In case of crossbreed cattle also it was showing the decreasing rate of -36% (303 to 191 from year 2000 to 2014). It shows that farmers discontinued the adoption of indigenous cattle as compared to crossbreeds. But overall livestock population was also decreased by -47 % was noticed.

Table 4.6.6 Change in cropping pattern from 2000 to 2014

Crops	Change in cropping pattern			
	2000	2005	2010	2014
Cereals	144 (90)	127 (79.4)	106 (66.3)	116 (72.5)
Pulses	75 (46.9)	59 (36.9)	52 (32.5)	44 (27.5)
Vegetables	80 (50)	71(44.4)	52 (32.5)	68 (42.5)
Fruit crops	44 (27.5)	43 (26.9)	35 (21.9)	34 (21.3)
Spices	20 (12.5)	14 (8.8)	14 (8.8)	15 (9.4)
Oilseed	7(4.4)	10 (6.3)	7 (4.4)	11 (6.9)
Flower crops	9 (5.6)	2(1.3)	11 (6.9)	15 (9.4)

Multiple responses counted

Source: Primary data collected from respondents

Note: Figures in parenthesis indicate the respective percentage

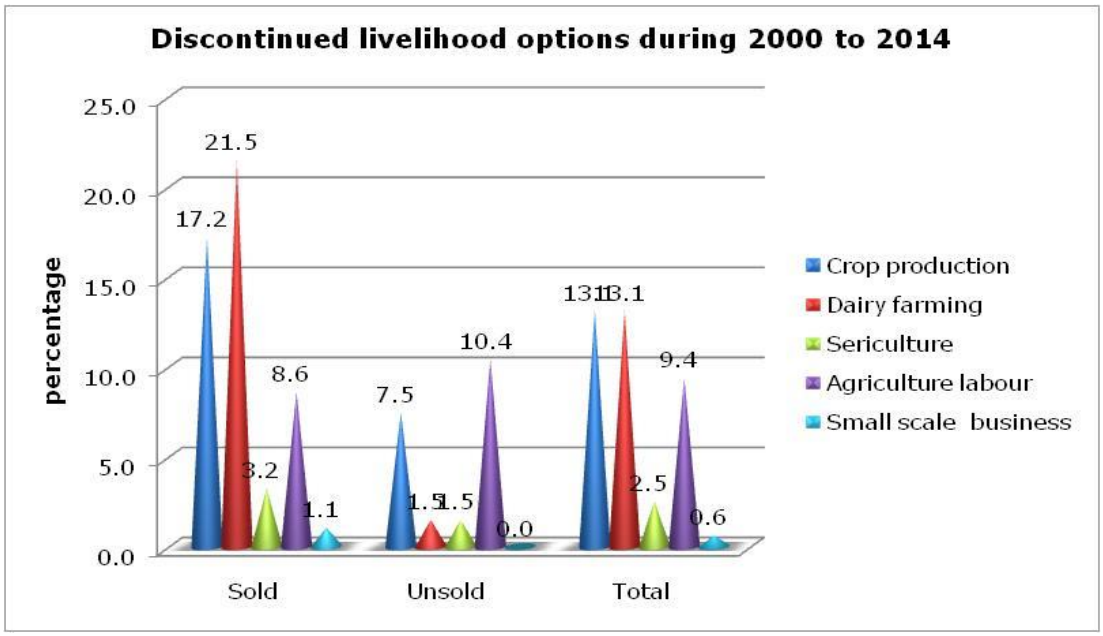


Fig. 4.17 Distribution of respondents based on discontinued livelihood options during 2000 to 2014

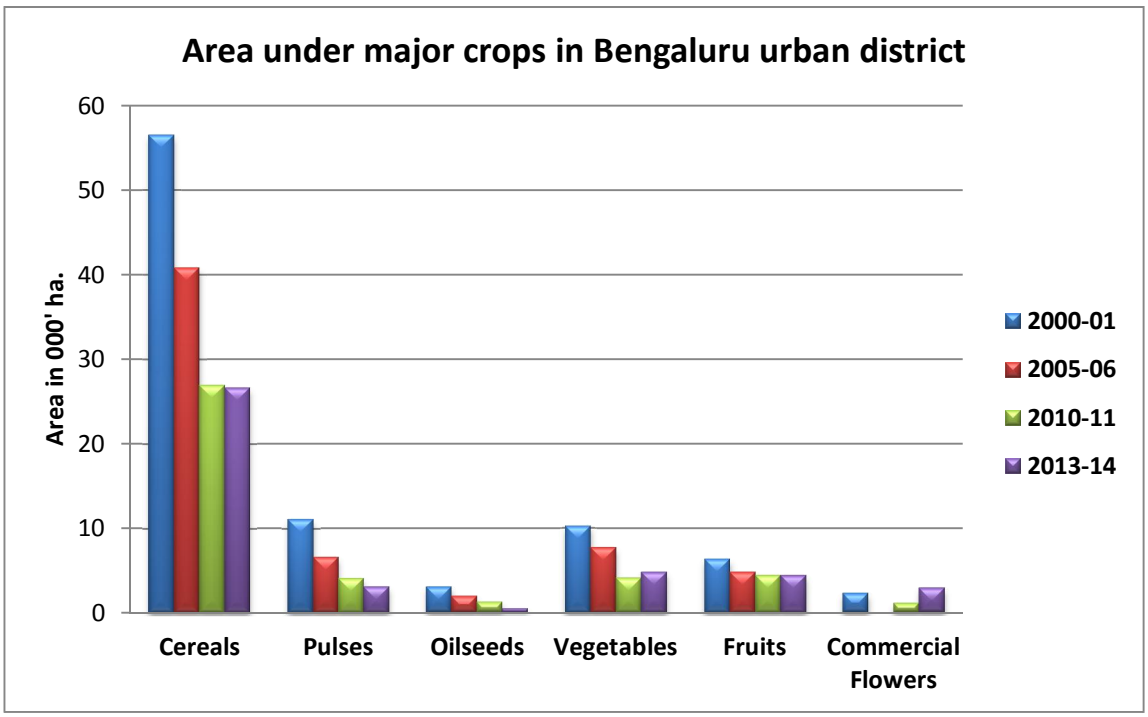


Fig. 4.18 Change in total area under major crops in Bengaluru urban district from 2000-01 to 2013-14

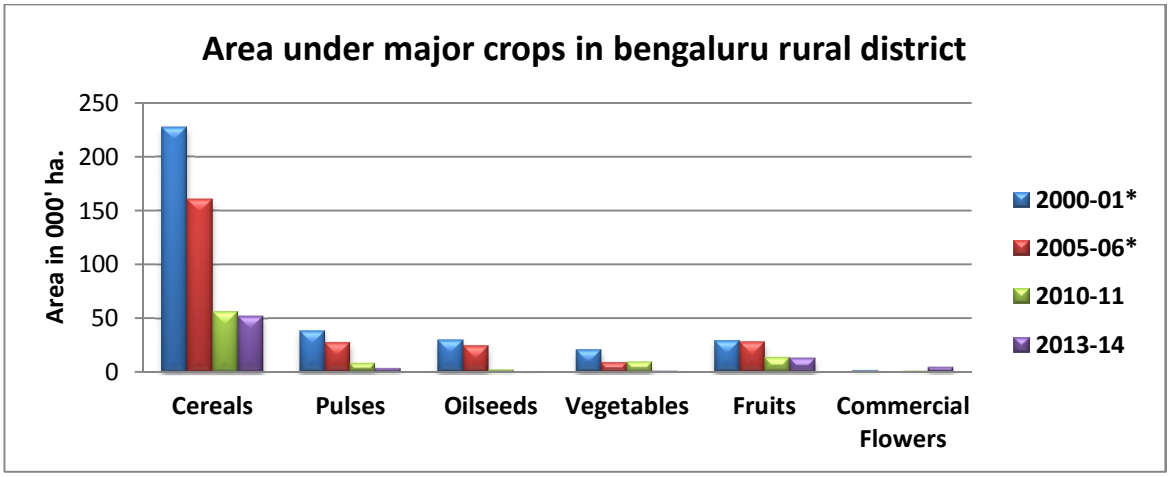


Fig. 4.19 Change in total area under major crops in Bengaluru rural district from 2000-01 to 2013-14

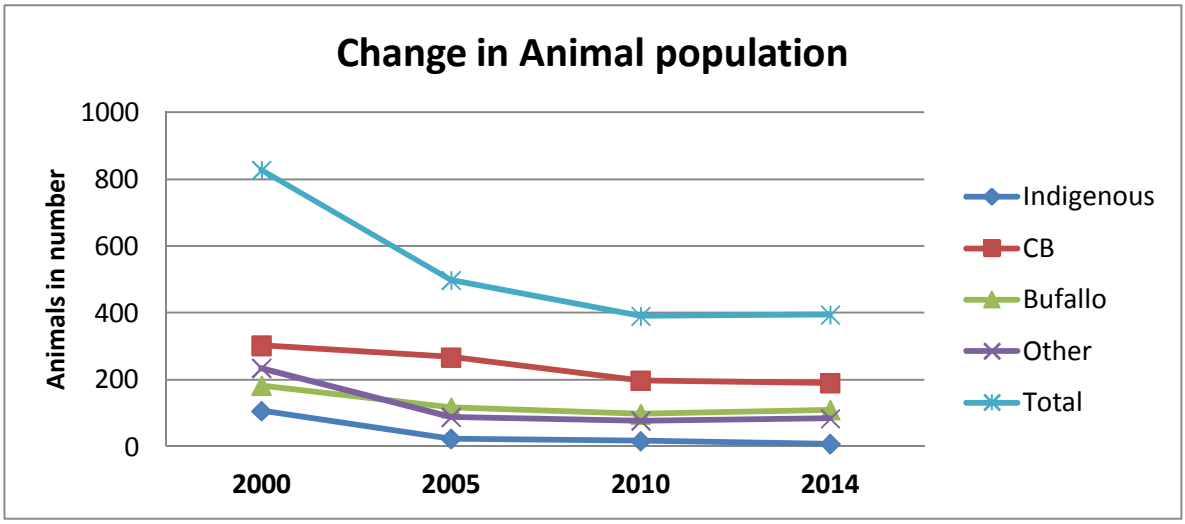


Fig. 4.20 Change in livestock holding of respondents from 2000 to 2014.

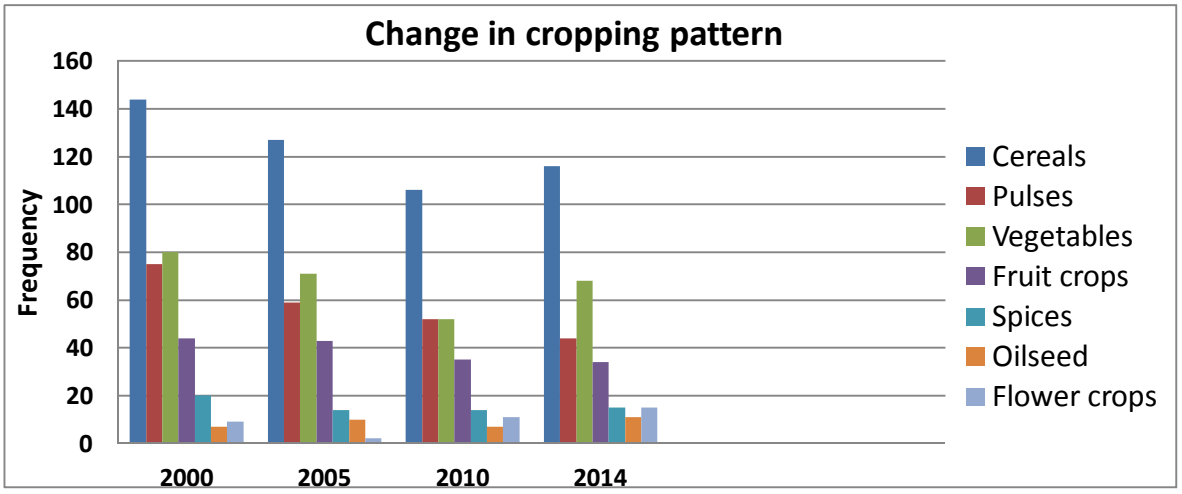


Fig. 4.21 Change of cropping pattern respondents from 2000 to 2014

It is evident from the table 4.6.6 that the farmers in the peri-urban area of Bengaluru had shifted their cropping pattern from food grains to commercial flower crops. From 2000 to 2014 percentage of respondents growing cereals are decreased by -17.5 per cent, Pulses decreased by -19.4 per cent , vegetables by -7.5 per cent , fruit crops by -6.3 per cent, spices -3.1 per cent , oilseeds -2.1 per cent decreased. But in case of flower crops the number of farmers growing was increased by 3.8 per cent from 2000 to 2014. The change in cropping pattern to commercial crops mainly due to huge market demand in the Bengaluru city and the flowers fetch high rate for flower like rose, marigold, chrysanthemum, gladiolus, gerbera etc. which are usually grow in the Bengaluru peri-urban region. Also they had exported through international market through Bengaluru international airport located in the peri-urban region and it also evident from the table no-4.6.7 that the area under flower crops has increased in last ten years.

4.7 Advantages in peri-urban dairy and crop production system

Table 4.7.1 Prioritised ranking of advantages of peri-urban dairy production system

Si. no	Advantages	Frequency of response for respective rank						Total (N)	RBQ value	Ranks
		1	2	3	4	5	6			
1	Availability of remunerative price for milk	39	70	8	11	16	16	160	72.6	II
2	Easy access to marketing of milk	7	25	63	30	19	16	160	58.6	IV
3	High demand for fresh milk	4	4	19	28	82	23	160	40.7	V
4	Additional source of income from peri-urban dairy farming	69	26	8	33	20	4	160	74.9	I
5	Productive employment to utilise the women's leisure time	19	23	45	54	7	12	160	62.2	III
6	Scope for marketability of value added dairy products	10	16	17	8	20	89	160	37.6	VI

The advantages of peri-urban dairy production system perceived by farmers are presented in table 4.7.1 findings indicate that additional source of income from peri-urban dairy farming had highest RBQ value 74.9, thus reported as most advantageous by the farmers. Most of the farmers in peri-urban areas were depending on crop production, allied agriculture activity and non-agriculture activity as their main source of income and considered dairy as an additional source for the support of their family income. Further, availability of remunerative price for milk was considered as second most advantageous factor with RBQ value of 72.6. The milk price is about 23 rupees/lit in milk co-operative society along with the support by the state govt. about 2 rupees bonus/lit would help the farmers to earn good income from dairy. In case of peri-urban farmers who sold their milk to the near urban areas. Selling of milk to the hotels, tea stall, urban dwellers etc. will fetch 30 rupees/lit prices. This amount will be more than that of price obtained from the co-operative society. The demand for fresh milk from peri-urban farmers by the urban dwellers was more and people choice for fresh milk from dairy farmers was more than that packaged milk. Productive employment to utilise the women's leisure time was considered as third most advantageous parameter with RBQ value of 62.2. Besides, easy access to marketing of milk (58.6), High demand for fresh milk (40.7) and scope for marketability of value added dairy products (37.6) were other advantages reported by farmers in peri-urban area of Bengaluru.

Table 4.7.2 Prioritised ranking of advantages in peri-urban crop production system

Si.no	Advantages	Frequency of response for respective rank					Total (N)	RBQ Value	Ranks
		1	2	3	4	5			
1	Less cost in transportation of farm produce	36	72	32	8	12	160	74	II
2	Easy market access to farm produce	64	32	64	0	0	160	80	I
3	Huge demand for fresh fruits vegetables and flowers	32	40	32	52	4	160	65.5	III

4	Remunerative price for farm produce	4	14	20	32	90	160	36.3	V
5	Scope to sell produce in the peri-urban locality itself	32	10	8	68	42	160	50.3	IV

The advantages of peri-urban crop production system perceived by farmers are presented in table 4.7.2 findings indicate that easy market access to farm produce had highest RBQ value 80, thus reported as most advantageous by the farmers of peri-urban of Bengaluru. Further, less cost in transportation of farm produce was considered as second most advantageous factor with RBQ value of 74. Huge demand for fresh fruits vegetables and flowers was considered as third most advantageous parameter with RBQ value of 65.5. Besides, scope to sell produce in the peri-urban locality itself (36.6) and remunerative price for farm produce with 36.3 is the least advantage reported by the farmers because of fluctuation in the prices, are the advantages reported by farmers of Bengaluru peri-urban locality. The table clearly shows that the cultivation of vegetables, fruits and flower crops were considered as advantageous over the cultivation of cereals, oilseeds and pulses production cereals and oilseeds because of most of peri-urban farming mainly focus on income oriented crops rather than subsistence farming.

4.8 Constraints in peri-urban dairy and crop production

Table 4.8.1 Prioritised ranking of constraints in peri-urban dairy production system

Si.no	Constraints	Frequency of response for respective rank						Total (N)	RBQ Value	Ranks
		1	2	3	4	5	6			
1	Increase in frequency of disease incidence in dairy animals	109	11	5	15	20	0	160	84.8	I
2	Insufficient land availability for fodder production	5	50	25	65	10	5	160	62.5	III

3	Non-availability of fodder on time	20	15	75	25	20	5	160	64.1	II
4	Difficulty to access immediate veterinary services	5	1	30	5	30	89	160	33.2	VI
5	High cost of private extension service at farmer's site	5	25	25	35	50	20	160	50.0	V
6	High cost of concentrate feed	10	60	5	30	15	40	160	56.3	IV

The constraints in peri-urban dairy production system perceived by farmers are presented in table 4.8.1 findings indicate that increase in frequency of disease incidence in dairy animals in the peri-urban dairy farming had highest RBQ value 84.8, thus reported as most serious constraint faced by farmers this was mainly due to adoption of high yielding cross breed animals in peri-urban areas where the crossbreed animals are most vulnerable to diseases as compare to the indigenous animals. This shows that there is a need for development of high yielding disease resistance crossbreed cows suited for the region which would help to boost farmers income by decreasing cost for maintenance of animals. Further, non-availability of fodder on time was considered as second most serious constraint with RBQ value of 64.1. Insufficient land availability for fodder production was considered as third most serious constraints with RBQ value 62.5. Besides, high cost of concentrate feed (56.3), high cost of private extension service at farmer's site (50.0) and the least constraint was difficulty to access immediate veterinary services with RBQ vale 33.2 was considered as the least constraints as farmer perceived that the veterinary service in their locality.

Table.4.8.2 Prioritised ranking of the constraints in peri-urban crop production system

Sr.No	Constraints	Frequency of response for respective rank					Total (N)	RBQ Value	Ranks
		1	2	3	4	5			
1	Non –availability of labour for farm work	74	24	46	6	10	160	78.3	II
2	Non–availability of irrigation water	71	34	42	12	1	160	80.3	I
3	High cost of labour	13	91	49	3	4	160	73.3	III
4	Wide seasonal variation in prices of farm produce	3	5	13	84	55	160	37.1	IV
5	Escalating input costs	5	6	18	50	81	160	35.5	V

The constraints in peri-urban crop production system perceived by farmers are presented in Table 4.8.2 findings indicate that non-availability of irrigation water had highest RBQ value 80.3, thus reported as serious constraint faced due to severe ground water exploitation and water depletion in peri-urban area of Bengaluru region. Further, non-availability of labour for farm work was considered as second most serious constraint factor with RBQ value of 78.3, this constraint was mainly because of diversion of agriculture labours to non agriculture activities in industries, construction work sites and especially female workers diverted to daily wage labours in garment factories in their near per-urban locality of Bengaluru. The study also revealed that from 2000 to 2014 about 9.4 per cent of respondents left agriculture labour (table 4.4.5). High cost of labour with RBQ value 73.3, wide seasonal variation in prices of farm produce (37.1) and escalating input costs with RBQ value 35.5 are the important constraints faced by farmers. Difficulty to access immediate veterinary services with RBQ vale 33.2 was considered as the least constraint faced by farmers in peri-urban crop production system.

4.9 Prospects of peri-urban dairy and crop production

4.9.1 Focus Group Discussion (FGDs) with per-urban farmers

The purpose of organizing the Focus Group Discussion (FGDs) was to understand the changes which occurred due to urbanization in the livelihood of the peri urban farmers. FGD gave lead on the important threats, opportunities for the peri-urban farmers, motivating reasons for keeping them in or away from farming as well as their needs and expectations in response to growing urbanization. FGD in fact elucidated the present changing scenario of farming in the peri-urban areas and in the Bengaluru especially highlighting of both positive and negative effects of urbanization on farmers.

Participants and Procedures

Focus group discussions were held during January, 2015. Three FGDs each was conducted in the three villages of peri-urban area of Bengaluru. FGDs were conducted after the respondents were interviewed during data collection. The selected villages were, namely, Marenahalli village of Devanahalli taluk from Bengaluru rural district, Hosahalli village of Bengaluru north taluk from Bengaluru urban district and Mandur village of Bengaluru east taluk from Bengaluru urban district. Number of participants ranged in size from 12 to 15 per group with similar background who were selected and discussion lasted from 60 to 105 minutes. The important key points were briefly noted and the discussion was tape-recorded with the permission of the participants.

Key Findings of FGDs

Analysis of focus group discussion transcripts revealed a number of key findings related to farmers experiences due to urbanization. The discussion revealed that from the last 10 years, the infrastructure in terms of basic amenities and life style had improved tremendously. In earlier days, farm families used to take a normal staple food. Dishes were taken only at the festivals and special dishes occasionally. They used to purchase dress once in a six month or even in a year that too only during important festival and functions. Proper roads were not there in their village before 10 years and drastic changes were observed especially now after establishment of international airport in Devanahalli taluk and rapid urbanization of Bengaluru. This also led to huge hike in land price (1 to 2 crore)

in the peri-urban regions nearly 10 times as compared earlier (15 to 20 lakhs). Due to urbanization, the most of the colleges and schools of high quality and facility were constructed in the peri-urban region in the recent past therefore farmers can send their children to the nearby schools and colleges. Most of the peri-urban children used to prefer ICSE/CBSE board schools rather than state board schools. Farmers explained that, these types of facilities will not be available be in the interior places.

The major problem faced by the farmers in peri-urban area revealed during discussion was ground water depletion. It was due to excessive ground water extraction for the agriculture and also encroachment of tanks in Bengaluru urban region. From past 6-7 years the ground water depletion was experienced as a severe constraint for the crop production and they explained that most of the tube wells are abandoned and for digging a new tube wells requires a minimum of 4 to 5 lakh rupees. The minimum depth to dig tube wells was 900 to 1500 ft depth to get water, many times even at 1200 ft tube wells are empty and had to pay nearly 3 to 4 lakh for digging. This situation was like “No water, No money for farmer” (*hakade neeru illa ekade dhuddu illaada anno paristhithi raithanige*) and even though they found water in digged tube wells it is uncertain that how many years or even some cases a months the tube well produce water. In such circumstances there is a loss to the standing crop and also loss of investment on tube wells. Therefore, the present generation of farmers now fearing to invest on tube wells and they were away from farming due to this uncertainty of getting water and fear to invest on tube wells, which is the main source of irrigation in peri-urban area of Bengaluru as no rivers/channels present in this region. That’s why all were attracted towards city for different livelihood options as emerged during the discussion.

The discussion was later focused on the timely availability of labour and high labour cost. Most of the agriculture labours in the peri-urban region were diverted towards the industries and companies located in the nearby fringes of the Bengaluru city as daily wage workers in a variety of occupations. Farmers explained that labourer felt that the working in farm is a heavy drudgery and labour wage was very low so, they diverted towards the employment in nearby cities where they had more opportunities. They get opportunity of job in cities like

working as a construction worker, night watch guards, office boy, hotel room keepers and shopkeepers etc. Especially the youths both men and women were working in the big malls, shops etc. The women labour were mostly diverted now towards construction work, garment shops etc. This causes a severe labour problem and thereby increasing the cost of labour. The male labour had to be paid 400 rupees per day while female had to be paid 350 rupees with afternoon lunch, thus under this situation it was very difficult to get profit from the farm.

Farmers are unanimous that farming is the one of the best occupations in the peri-urban region only with assured irrigation. This necessitates regulation of ground water extraction and streamlining the water usage system. There is a huge demand for vegetables in the market which requires assured irrigation. The important positive side of urbanization was availability of market. Some farmers linked their production of fruits and vegetables to the Safal markets (Safal, the Fruit & Vegetable business initiative of Mother Dairy Fruit & Vegetable Pvt. Ltd with a noble objective of facilitating a direct link between Fruit and Vegetable Growers and Consumers) and also to the nearby market "*Rythara santhe*" where direct marketing facility was available for fresh vegetables and fruits, which helps them to sell their produce directly to the urban consumers. So, this type of linkages ensures the farmers to get good price throughout the year. There is a wider fluctuation in the prices especially for the commercial crops like tomato, potato and onion. This leads to the situation of jackpot sometimes, but many a times they can't even get the cost of cultivation due to wide fluctuation in the prices. Farmer quoted "*vevasaya mane mandhi saya*" (Doing agriculture means dying family members with drudgery) so; they want their children to get well educated and don't want them to take agriculture as their future occupation. Majority of participant farmers stressed this point but some farmers opposed this view and explained that farming is the best activity in this region where it will give them self-sustaining activity for majority of peri-urban locality farmers. Farmers explained that especially today's unemployed youths in their villages were choosing the other non-drudgery activities like small business (provision stores, mobile shops etc). But small and marginal farmers (those who had less land) dairy farming was really a supporting pillar to their livelihood. But they also explained that the most of the above average income level groups leaving dairy

because present generation women now a day's became urban consciousness they don't want to rear and take care of the animals. The farmers elucidate that (*evaga sagani yaru muttuthare) "who will touch dung now a days*". They explained that the maximum number of households is maintaining one or two milch animals for home consumption.

Regarding land sale, farmers make clear that, this was mainly due to urbanization and the starting of the Kempegowda international airport in the Bengaluru rural district which hiked the cost of the land in the surrounding taluks. The farmers who sold their land last 10 or 5 years before were really sad for their decision. One of the farmers told that "what to do now" that time everybody about 1-2 acre partially sold their land. So, they also sold a small portion of their land along with them for only 15-20 lakh per acre during that time. Current price of one acre land was 1-1.5 crore mostly benefitting the real estate companies who purchased their land. Those who retain their land are the lucky persons. *"They are the crorepathis of their village in future"* farmers explained. The farmer revealed that the real estate company purchased land from the surrounding neighbours land. This obstructed the pathway to their land which forced them to sell land to real estate companies. They also explained that some of the agricultural labours who sold their land wasted money for alcohol consumption and other unproductive purpose without proper utilization of money obtained from the land sold; those villagers are now going to work as a daily wage labourer in the same companies to whom they sold their land. Large stretch of land was made as plots and was fenced along the boundaries with the hoarding boards of the company. In some places, lands were purchased and fenced and kept as such without any construction during last 10 year or any purpose. It will take another 10 more years to construct buildings or plots because it still requires years to spread urban sprawl/ built-up area. This was a pathetic situation that even though there is no immediate need for infrastructure/construction for urban population peri-urban precious farm land from the farmers was purchased in low price.

Land acquisitions by the government and the demand for the lands by real estate companies were emerging major threats in that region especially in the Devanhalli taluk (block) of Bengaluru rural district, where the Kempegowda

international airport was started in the recent past. Now the villages around the region were facing several hardships and the farmers were lured by the real estate companies by showing them big amount. It was clear that the precious agriculture land loss was severe in that region which is directly impacting on agriculture and fodder security for the livestock. Later the discussion was focused on change in the lifestyles of the peri-urban region, where women had the maximum share in the rearing of livestock in the rural villages. Whereas, in peri-urban region high income household women were less interested to handle the animals especially as they became more urban conscious and follow modern lifestyles.

The discussion highlighted the positive aspects of urbanization where farmers were satisfied about higher prices for agriculture commodities. Milk price also increased that make a farmer to get sufficient income for the family. They discerned that farming is best activity in response to pace of urbanization in accordance with a sufficient irrigation facility. Due to urbanization and increase in the demand price for the vegetables, farmers earn good income and achieve better livelihood. Dairy is the best occupation as the demand for the fresh milk from the urban area was more and consumers were ready to give more prices for quality milk.

Positive points emerged during discussion

- Urbanization improved standard of living of the farmers
- Better access to the educational institutes results in improvement in the education level of children
- Diversification in the household livelihood pattern with on farm as well as off farm sources of income.
- Peri-urban dairy farming acts as supportive occupation for low and middle income group families who sold their land.
- Urbanization offers off farm employment for the peri-urban unemployed youth.
- Opportunities for direct linkage of marketing of farm produce to peri-urban locality.

Negative points emerged during discussion

- Agriculture labour migration to cities causes severe farm labour shortages
- Increased demand causes high cost of labour
- Unethical land purchases and land transactions noticed
- Urbanization leads to severe agriculture farm land loss in peri-urban region
- Youths are diverted away from farming even they have sufficient facility available for farming
- Economically backward farmers are suffering most from the land acquisitions.
- Lack of coping mechanism for the problems/ during distress situations by farmers and selling of land was the method of choice as a solution for problem/distress.
- More urban conscious women from peri-urban households showed unwillingness towards working in dairy farming.
- Negative perception on agriculture and dairy farming and urban consciousness will ruin the agriculture slowly in the peri-urban localities.
- Especially in the distant peri-urban region where impact of urbanization was low farmers are interested in agriculture and dairy whereas in intermediate and nearer peri-urban areas, farmers are showing negative attitude towards agriculture and dairy.
- Increase in price of land was restricting the farmer to expand his farm activities to more areas through further purchase of land.
- Urbanization caused negative impact on the agriculture in the form of farm land loss for non agricultural activities
- Other than effect of urbanization - Lack of irrigation and increase in the cost of cultivation were the major problems faced among the peri-urban region farmers.

Recommendations

- Regulating ground water extraction and ensuring water use efficiency for peri-urban farming.
- Clear demarcation for land transaction and acquisition to be notified with prior information based on the need of land requirement.

- ❖ Need for promotion of polyhouse cultivation (protected cultivation) for export oriented commercial crops.
- ❖ Need to attract the youths to farming by capacity building in areas like cultivation of commercial crops as well as starting commercial dairy.
- ❖ Promote the peri-urban women's SHGs for establishment of the dairy enterprises for making value addition to milk.
- ❖ Formulating government schemes for promoting exclusively on peri-urban crop and dairy production in peri-urban region.
- ❖ The effects of urban growth on urban agriculture should be considered in planning decisions which would help to made region specific peri-urban crop and dairy programmes for further strengthening of them in peri-urban locality of Bengaluru.

Farmer quotes:

"Hakade neeru illa ekade dhuddu illaada anno paristhithi raithanige"

"Avaga bhumi yaru marillavo avane kotyadipathi"

"Vevasaya mane mandhi saya"

4.9.2 SWOT analysis of peri-urban dairy and crop production system

The SWOT analysis was carried out with the a sample of 20 farmer respondents having mixed group of different farm enterprises in order to understand the changes in the structure and functioning of peri-urban farming system and derive the information about the strengths (S), weakness (W), threats (T) and opportunities (O) of the peri-urban crop and dairy production system. The selection of respondents was made by keeping in mind their in-depth subject knowledge and various practical experiences they gain during their course of profession. Then respective cross marks assigned in front of statement in table 4.9.2 and interpretation was done accordingly.

xxxxx - Greatest strength/weakness/opportunity/threat

xxxx -Greater strength/weakness/opportunity/threat

xxx - Medium strength/weakness/opportunity/threat

xx- Lesser strength/weakness/opportunity/threat

x- Least strength/weakness/opportunity/threat

Fig. 4.22 Collection of data in the peri-urban villages of Bengaluru

Fig. 4.23 Conducting Focus Group Discussion with respondents of peri-urban village Hosahalli, Bengaluru North taluk, Bengaluru urban district

Fig. 4.24 Conducting Focus Group Discussion with respondents of peri-urban village Marenahalli, Devanahalli taluk, Bengaluru rural district

Table 4.9.2 SWOT analysis for peri-urban crop production system

Sr. No.	Parameters of peri-urban crop production	Notation	Rating
1	Availability of market	S	xxxxx
2	Remunerative price for the crop produce	S	xx
3	Availability of transportation facility	S	xxx
4	Access to farm inputs	S	xx
5	Sell crop produce in peri-urban locality itself	S	xxxx
6	Meeting demand of fresh crop produce of urban population	S	x
7	Availability of labour	W	xxx
8	High labour cost	W	xxxx
9	High Cost of cultivation	W	xxx
10	High incidence of disease and pests to crop	W	xxx
11	Intensive farming (high chemical usage)	W	xx
12	Use of sewage water	W	xx
13	Use of urban effluents as manure containing harmful substances	W	xxx
14	Better scope for production of export quality produce	O	xx
15	More scope for Contract farming	O	xx
16	Better market for sale of organic products	O	xxx
17	Effective utilization of urban waste as manure	O	x
18	Availability of cold storage facility	O	x
19	Growing of high valued commercial crops	O	xxxxx
20	Cultivation of need based crops for agro-based industries located in peri-urban region	O	xxxx
21	Conversion of agriculture land to non-agriculture use	T	xxxxx

22	Problem of Environment pollution due to urban waste disposal in peri-urban areas	T	xxx
23	Farmer becoming status conscious and hence diverting to non-farm activity	T	xxxx
24	Loss of balanced agro-ecosystem due to rapid industrialization in peri-urban regions	T	xx
25	Luring of farmers due to predatory land value /price	T	xxx
26	Land acquisition policies of government	T	xxx
27	Drastic increase in the value of peri-urban lands limiting the capacity of farmers to expand their farming activities	T	xxxx

Table 4.9.2 depicts the results of SWOT (strengths, weaknesses, opportunities and threats) analysis of the peri-urban crop production system in the study area. Among the strengths of the peri-urban crop production system, availability of market is the greatest strength of the peri-urban crop farming as considered by the farmers because of a good demand posed by the urban population for fresh vegetables, fruits and flowers. Another greater strength was selling crop produce in peri-urban locality itself which helps in reduced transportation cost to market and better price because of readily available potential urban consumers seeking for fresh farm produce. Other important strengths are remunerative price for the crop produce, availability of transportation facility and access to farm inputs because of nearness of city are pointed out by the farmers.

The major weakness noticed by the peri-urban farmers was non-availability of labour. Because of diversion of agriculture labours towards other activities in the nearby city causes severe labour problems in peri-urban region. Other than this, high labour cost, high cost of cultivation, high incidence of disease and pests to crop, intensive farming (high chemical usage), use of sewage water and use of urban effluents as manure containing harmful substances were noticed by farmers.

Better opportunity for growing high valued commercial crops and cultivation of need based crops for agro-based industries located in peri-urban region as it

minimizes the uncertainty of demand and prices are opportunities for peri-urban farmers. Farmers make contract with the agro-based industries and supply farm produce as per their requirement at fixed market price thereby avoiding market risk. Other than this, better scope for export quality produce, contract farming, better market for organic products especially for export oriented, effective utilization of urban waste as manure and availability of cold storage facilities are the important opportunities as they noticed. With relation to the threats expressed by the peri-urban crop producing farmers conversion of agriculture land to non-agriculture use was most serious as the land acquisitions and land transactions by real estate companies and agents are active in the peri-urban region and hiking of money value for agriculture farm land lure farmers to sell their land which causes threat to agriculture production in and around city periphery.

Apart from this, farmers also reported threats like environment pollution due to urban waste disposal in peri-urban areas, farmer becoming status conscious and hence diverting to non-farm activity, loss of balanced agro-ecosystem due to rapid industrialization in peri-urban regions, luring of farmers due to predatory land value /price, land acquisition policies of government threaten the farmers to loss their land and drastic increase in the value of peri-urban lands limiting the capacity of farmers to expand their farming activities are the threats expressed by farmers in peri-urban area of Bengaluru.

Table 4.9.3 SWOT Analysis for peri-urban dairy production system

Sr. No.	Parameters	Notion	Rating
1	Dairy farming act as subsidiary source of income	S	xxx
2	Effective utilization of family labour	S	xxxx
3	Ready market for fresh milk	S	xx
4	High demand for fresh milk by large urban consumers	S	xxxx
5	Remunerative price for milk	S	x
6	Animal prone to disease	W	xxx
7	Non-availability of fodder round the year	W	xxxx

8	Lack of availability of space for maintenance of larger herd size	W	x
9	Lack of space for proper storage of fodder	W	x
10	High fodder cost	W	xx
12	Availability of family labour	W	x
13	High cost of maintenance for cross breed animals	W	xx
14	Less scope for grazing of animals	W	xxx
16	Scope for value addition	O	xx
17	Scope for sale of organic dairy products	O	xxx
18	Opening of dairy entrepreneurship co-operatives for processing of value added products from milk to supply as per urban need	O	xxxx
19	Additional employment to women	O	xxxxx
20	Environment pollution in peri-urban affecting quality of milk	T	xxx
21	Loss of grazing lands	T	xx
22	Decrease in milk production due to environment pollution	T	xx
23	Decrease in land for cultivation for fodder cultivation	T	xxxx
24	Farmer becoming status conscious and hence diverting to non-farm activity	T	xxxxx
25	Conversion of agriculture land to non-agriculture use threaten the fodder security for animals in peri-urban region	T	xxx

Table 4.9.3 disclosed the results of SWOT (strengths, weaknesses, opportunities and threats) analysis of the peri-urban dairy production system in the study area. The strengths of the peri-urban dairy production system are the dairy farming act as subsidiary source of income, effective utilization of family labour, ready market for fresh milk, high demand for fresh milk by large urban consumers, remunerative price for milk availability of market etc. and the rating was given to effective utilization of family labour especially the women in the peri-urban region

was the greatest strength of the dairy production system as perceived and noticed by the farmers.

Regarding peri-urban dairy, farmer also noticed some of the weaknesses *viz.*, animal prone to disease, lack of availability of space for maintenance of larger herd size, lack of space for proper storage of fodder, high fodder cost, unavailability of family labour, high cost of maintenance for cross breed animals and less scope for grazing of animals. Non-availability of fodder round the year was rated as the greatest weakness to dairy farming in the peri-urban region.

About opportunities of peri-urban dairy, farmers identified many opportunities some of them includes scope for value addition of milk and organic milk products which is potential demand in urban market for organic goods, especially for elite urban dwellers and also opening of women dairy entrepreneurship co-operatives for processing of value added products from milk to supply as per urban need helps to empower the women in peri-urban and helps to strengthen the peri-urban dairy production system.

About major threats as articulated by the farmers includes environment, loss of grazing lands, decrease in milk production due to environment pollution especially in the villages near to the industrial corridors and decrease in land for fodder cultivation, conversion of agriculture land to non-agriculture use threaten the fodder security for animals in peri-urban region are the notable threats expressed by peri-urban farmers and status conscious of farmers divert them away from farm activity are rated the most threat expressed by peri-urban farmers.

CHAPTER – 5

SUMMARY & CONCLUSIONS

SUMMARY AND CONCLUSION

The rural ï urban population distribution in India is 68.84 per cent and 31.16 per cent, respectively and the level of urbanization increased by 3.35 per cent from 2001 to 2011 census. The increase in the population of urban areas is an indicator for the extent of decrease in the land for cultivation year after year. By 2050, India with about 1.7 billion people will be the most populous country in the world (Census of India 2011). By 2050, in India nearly 1 billion will be urbanized and the largest share will be of the rural migrants. The fast changing dietary habits, increasing income and rapid urbanization due to demographic and economic expansion of the cities through migration and industrialization, will further proportionately accelerate the peri-urban population and the demand for the higher quantity of quality milk and food security of urban population is the great question in coming decades. Presently dairying is progressing at 4 per cent level of growth but required growth rate is 6 per cent in order to meet the demand of 200 mt milk by 2021-22. One major opportunity is to exploit dairying and crop production potential in peri-urban areas. Peri-urban crop & dairy has major influence on livelihoods of farm families present in and around the periphery of the cities. But, there are certain limitations in promoting dairy and crop production system in a sustainable way in peri-urban region due to dynamic change in the livelihood pattern and rapid conversion of farm lands in and around the cities mainly due to rapid urbanization. So there is a need for a study on effect of urbanisation on the livelihoods of farmers.

In view of all this background information, the present research entitled ñ**Effect of Urbanization on Livelihood of Farmers in Dairy and Crop Production System in the Peri-urban area of Bengaluru**ò was undertaken with the following objectives for investigation:

1. To investigate the effect of urbanization in the current pattern of Dairy and Crop production scenario in the peri-urban area
2. To study the livelihood pattern exercised by the farmers and factors influencing upon them due to the urbanization process

3. To explore the scope and opportunities in Dairy and Crop production for promoting livelihood of farmers in response to pace of urbanization

5.1 RESEARCH METHODOLOGY

Karnataka state was selected purposively in view of fast emerging trend of urbanization. Bengaluru metropolitan region (Bangalore urban and rural districts) was selected purposively, as research is mainly focused on the peri-urban area of Bengaluru. Four blocks around the city periphery were selected purposively due to its peri-urban characteristics. Two villages were randomly selected from each block. From each village 20 respondents were selected randomly. Hence, a total of 160 respondents constituted the sample size and data collection was done through PRA tools and semi-structured interview schedule. Changes in area, production of crops, milk and livestock population were studied with growth rate and trend analysis. Thereafter descriptive statistics, percentage growth rates, RBQ Technique, SWOT analysis and multinomial logit method were used in data analysis in order to draw meaningful conclusions.

5.2 SALIENT FINDINGS OF THE RESEARCH

5.2.1 Socio-personal and economic profile of peri-urban respondents

- Study revealed that majority of respondents from sold (41.9%) and unsold category (41.8%) was belonging to middle age group (36-50 years). In case of sold category as compare to unsold category the farmers in young age group (upto 35) were more about 3 per cent.
- Study revealed that majority of the respondents from economically and socially backward (schedule caste and schedule tribes) in sold category was more (24.7%) as compare to unsold category (11.9%). This shows that majority of poor farmers sold their land.
- Majority of the respondents were educated upto matriculation level (31.3%). As compare to unsold category the sold category respondents found in more graduate and above level of education (9.7%) as compared to unsold category (4.5%).
- It revealed that 46.3 per cent respondents belonged to medium category (5-8 family members) in case of both sold and unsold category of the

respondents. It was also found that very less number of respondents were belong to large family size (>8 members).

- More than half of respondents in sold category (55.9%) had marginal land holding as compared to unsold category (37.3%) this is mainly because of after selling of land majority of respondents in sold category respondents marginalized.
- Low income groups were high in unsold category (19.4%) as compare to sold category (11.8%). As both sold and unsold category chooses diversified livelihood options to earn their income, whereas in case of unsold category the percentage of diversification was low as compared to sold category.
- It was obvious from this study that family education status of sold category was better as compared to the unsold where majority of respondents in category unsold (49.3%) belong to low family education status (FES). But sold category (44.1%) having better FES. It shows that families having good education status were more intended to sell their land.

5.2.2 Farm land selling pattern of peri-urban respondents

- Study revealed that out of total 160 respondents, in sold category about 93 respondents (58.1%) (partially/fully) were found and who retain land fully were about 67 respondents (41.8%).
- In sold category (n=93) nearly 71 per cent of the farmers had sold their land to real estate owners, in which nearly 21.5 per cent to Government and 7.5% of them sold to neighbours. It shows that real estate buyers are more involved in peri-urban land transactions from farmers.
- Responses about future selling of land revealed that majority of respondents (55.6%) were not intend to sell land.

5.2.3 Livelihood pattern of peri-urban respondents

- It could be observed that in sold category, majority of the respondents (40.9 %) had crop production as main livelihood occupation. In the unsold

category the percentage of respondents had crop production was high (53%) as compared to sold category respondents.

- More than one-fourth (29.90%) of the unsold respondents had dairy farming as their subsidiary occupations compared to sold category. It was revealed from study that majority of respondents in sold category (20.4%) are practicing crop farming as their subsidiary livelihood source. This showed that scarcity in availability of land after selling their land farmers prefer crop production as subsidiary livelihood source due to marginalized land.
- It can be articulated that crop+dairy was the major present livelihood occupation pattern among both unsold (31.30%) and sold farmers (22.60%), next tracked by crop+dairy+allied non-agriculture activity by 22.40 per cent of unsold and 19.40 per cent of sold farmers in peri-urban area of Bengaluru.
- Study revealed that nearly two-fifth of respondents (17.2%) were added small scale business as their part of household livelihood from year 2000 to 2014 period of time. This clearly shows that peri-urban families are gradually diverted towards off farm activities.
- Among sold respondents, Depeasantization (left the dairy farming (21.50%) and crop production (17.20%) as livelihood option) rate was more than that of unsold category. While it was less among unsold farmers about 1.50 per cent and 7.450 per cent respectively.
- Diversion of agriculture labour to other activities was considered more as about 9.4% of respondents who had left agriculture labour over fast 15 years.

5.2.4 Factors affecting livelihood pattern of peri-urban respondents

- In Multinominal regresssion logit method of analysis the ßetaôcoefficient for family labour migration was found to be positively significant in all the three categories of livelihood options. This indicates that as the number of family labour for migration increases, the choice for livelihood options was found to be more in the case of non-agricultural activities (4.82), followed by agriculture and non-allied activities (3.46) and agriculture and allied activities (3.35) in comparison to the base category i.e. crop+dairy activity.

- It also revealed that in other words, if there is a unit decrease in the herd size, the likelihood of choosing the non-agricultural activities increases by 4.49 units followed by agriculture and allied activities (0.29) in comparison to the reference category ócrop+dairyô
- The beta coefficient for land holding was negatively significant in non-agricultural activities. The marginal or landless farmers or those who had sold their land were diverted to non-agricultural activities as they are getting more off-farm jobs or business opportunities in the nearby cities.

5.2.5 Change in livestock and cropping pattern in peri-urban area of Bengaluru (Bengaluru urban and rural districts)

- The livestock census report for Bangalore urban and rural district shows that from 1997 to 2012 the total livestock population was showing negative growth rate in both the districts. Comparison to Bangalore rural, Bangalore urban was showing positive growth rate in total cattle population due to adoption of high crossbreeds in both the districts.
- The area under cultivation of cereals, pulses, oilseeds shows drastic reduction from 2001 to 2014, the area under vegetables and fruit crops also decreased slowly. But the area under commercial flower crops was showing positive trend from 2000-01 to 2013-14.
- Primary data of 160 respondents indicated that decrease in animal holding of respondents was noticed over the year from 2000 to 2014. Moreover, there was large scale reduction of indigenous cattle among the respondents.
- Data revealed that majority of respondents changed their cropping pattern from food gains to vegetables, fruit crops and flower crops.

5.2.6 Prioritizing the advantages and constraints of peri-urban crop and dairy production system

- Findings indicate that additional source of income from peri-urban dairy was reported most advantageous by the farmers, further availability of remunerative price for milk, high demand for fresh milk are the major

advantages of peri-urban dairy production system. In crop production system, easy market access to farm produce reported as most advantageous followed by less cost in transportation of farm produce and huge demand for fresh fruits vegetables and flowers was the major advantages in peri-urban crop production.

- Major constraints in practicing peri-urban dairy was; increase in frequency of disease incidence in dairy animals (due to adoption of high yielding crossbreeds and also environmental issues - presence of garbage in and around the peri-urban region of Bengaluru), non-availability of fodder in time and insufficient land availability for fodder production due to partially selling of land.
- Non-availability of irrigation water was reported as serious constraint faced due to severe ground water exploitation and water depletion in peri-urban area of Bengaluru region. Further, non-availability of labour for farm work was mainly because of diversion of agriculture labours to non agriculture activities in industries, construction work sites and especially female workers diverted to daily wage labours in garment factories in their near per-urban locality of Bengaluru it also affect on increase in labour cost in peri-urban region.

5.2.7 Needs and opportunities in peri-urban farming

- FGD findings expose the positive effects of urbanization of peri-urban farmers who had better access to the educational institutes for their children, diversification in the household livelihood pattern with on farm as well as off farm sources of income. Peri-urban dairy farming acts as supportive occupation for low and middle income group families who sold their land. Urbanization offers off farm employment for the peri-urban unemployed youth. Opportunities for direct linkage of marketing of farm produce to peri-urban locality are major advantageous effect of urbanization to peri-urban farmers in Bengaluru.
- It also revealed the negative effects of urbanization on peri-urban farmers as there is a lack of coping mechanism to face problems/ during distress situations by farmers and selling of land was the method of choice as a

solution for problem/distress, Unethical land purchases and land transactions noticed, youths are diverted away from farming even they have sufficient facility available for farming, Economically backward farmers are suffering most from the land acquisitions due to inadequacy in financial literacy for productive invest money obtained by land sold.

- SWOT (strength, weakness, opportunities and threats) analysis with farmers in peri-urban village Hosahalli revealed more or less similar but good results as obtained in advantage and disadvantages. The major strengths was availability of market for farm produce in near urban locality and high cost of cultivation due to more labour charge and input price are the weakness. Growing of demand oriented high valued commercial crops and threat of drastic increase in the value of peri-urban lands limiting the capacity of farmers to expand their farming activities were mentioned by farmers in crop production.

- In dairy farming effective utilization of family labour was greatest strength, non-availability of fodder round the year was greatest weakness, opportunity for better utilization of leisure time of women and greatest threat was farmer becoming status conscious (especially women) and showing negative attitude towards maintaining of animals were most important points expressed by farmers.

5.3 IMPLICATONS OF FINDINGS

- Inadequate availability of water was identified as the major constraint in peri-urban region of Bengaluru. Scarcity of water for agriculture directly affects the peri-urban farmerôs livelihood condition. So this necessitates the need for sensitization of farmers on water use efficiency and rainwater harvesting methods and the care must be taken to prevent the encroachment of tanks for infrastructure development in and around city periphery. Compulsory implementation of rainwater harvesting in all new constructions can increase the ground water level in the city periphery.

- Increasing breeds and disease incidence in peri-urban areas need a segmented approach such as demarcation of areas and developing guidelines for peri-urban farming.

- The trend of nuclear family results in loss of family labour for performing various operations. This requires user friendly selective mechanization including milking machines, fodder cutters etc.
- As majority of those who sold land happened to be marginal farmers, risk bearing capacity of them needs to be improved with appropriate schemes and sensitization about management of farm and family; with scientific and pragmatic approach.
- More than 2/3rd of respondents sold their land to real estate firms revealing booming of this business. This requires further exploration of purpose and magnitude of purchased land in order to elicit the information for proposed land acquisition/rehabilitation and settlement bill in Indian parliament.
- The wide variation in money utilization pattern after sale of land demands increasing financial literacy for prudent investment and return.
- Indians considering gold and land as permanent worthy investments, about 55.6 per cent of respondents did not intend to sell land in near future. This category of respondents should be imbibed with scientific farming practices to exploit the potential of peri-urban farming prospects.
- Imparting skills through Agricultural Skill Council of India is essential in view of wide spectrum of livelihood options exercised by respondents as they may lack expertise in many new employment avenues.
- Considering the constraints in peri-urban farming, promotion of selective mechanization, disease surveillance, crop and livestock insurance, cold chain or warehousing and strict implementation of environmental laws are essential.
- SWOT clearly indicates the need for formation of Farmer Producers Company in peri-urban areas to capitalize the growing opportunities and address of weaknesses of peri-urban crop and dairy farming.
- Focus group discussions point out the need for promoting preparation of value added products (secondary agriculture) and fodder based entrepreneurship.

- Need for schemes and technologies exclusively focused on the peri-urban dairy and crop farming is prerequisite in the peri-urban area as many of the schemes are technologically fitted to rural areas that will work under dynamic change situation of peri-urban regions.

5.4 SUGGESTION FOR FUTURE RESEARCH

1. Diagnostic study on performance of various occupations as a result of urbanization impact on farming
2. Effect of role and regulation of government on the activities in peri-urban farming
3. Impact of urbanization on gender roles, perception and performance among farm families in peri-urban areas
4. Scope and opportunities for multi-layer farming, protected cultivation, precision farming and secondary agriculture in peri-urban areas
5. Impact of Depeasantization process on the livelihood of peri-urban farm families

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ANNEXURE

APPENDIX-I

NATIONAL DAIRY RESEARCH INSTITUTE
(Deemed University)
Karnal, Haryana

Semi-structured Interview schedule

"Effect of Urbanization on Livelihood of Farmers in Dairy and Crop Production System in the Peri-urban area of Bengaluru"

Sl no._____ Date: _____

Village _____ Block _____

District_____

Socio-personal profile

1. **Name of the respondent:**_____
2. **Age (in years):**_____
3. **Sex :**Male / Female
4. **Education status :** Illiterate/Primary/Matriculate/Intermediate/Graduate and above
5. **Caste:** _____
6. **Family particulars:**
   a) **Family type** : Nuclear/Joint
   b) **Family size (No.):** <5 members/5-8 members/>8 members
7. **Family members details:**

Si no.	Members relationship with respondent	Age	Education	Occupation
1				
2				
3				
4				
5				

8. **Land holding:**

Type of land	Dry land	Irrigated	Orchard	Unutilized	Any	Total
Owned land						
Leased in						
Leased out						

9. **Land sold :** Whether have you sold land, **Yes/No**, if **yes**; give the following details

Details		To whom land sold			No. of acres	Amount of sale/acre
		Real estate	Neighbour farmer	Govt.		
Sold	**Partially**					
	Completely					
Loss	**Partially**					
	Completely					

10. Give the reasons for selling your Agriculture land

_____
_____
_____
_____

11. How did you use the money after selling the land?

_____
_____
_____
_____
_____
_____
_____

12. Are you willing to sell your land in near future: **Yes/No.**
If **yes or No** provide the reason

_____
_____
_____

13. **Annual Income from different source**

Present livelihood Activity	**Annual income in Rupees**				**Remarks**
	2000	**2005**	**2010**	**Present (2014)**	
Crop production					
Dairy farming					
Allied agriculture activity					
Agriculture labour					
Artisan /craftsmen					
Small scale business					
Manual worker in industry					
Real estate activity					
Govt/private job					
Others (specify)					
Total					

14. **Livelihood pattern of the respondents over the years and no. of family labour migrants for particular activity. (No.*-no. of family labour migrants involved in activity)**

Present livelihood Activity	**Major**		**Minor**		**Year of activity started**
	Tick	**No.***	**Tick**	**No.***	
Crop production					
Dairy farming					
Allied agriculture activity					
Agriculture labour					
Artisan /craftsmen					
Small scale business					
Manual worker in industry					
Real estate activity					
Govt/private job					
Others					
Total					

15. Present livelihood pattern of the family (combination of activity)-

_____

16. **Change in the livelihood pattern and reasons for change(Tick respective occupation & mention the influencing factor in case change in livelihood occupation)**

Change in livelihood Activity	Activity left	Major influencing factor	Activity added	Major influence--ng factor	No change	Major influencing factor
Crop production						
Dairy farming						
Allied Agriculture activity						
Agriculture labour						
Artisan/Craftsmen						
Own business						
Manual worker in Industry						
Real estate activity						
Govt/private						
Other						
Total						

17. **Change in cropping pattern over the years**

Crops	2000	2005	2010	Present				Reason for change in crop
				Crop	Area	Yield	Income	
Cereals								
Paddy								
Finger millet								
Maize								
Sorghum								
Other								
Pulses								
Dalicas lablab								
Pigeon pea								
Other								
Vegetables								
Tomato								
Cabbage								
Cauliflower								
Beans								
Cucumber								
Carrot								
Beans								
Leafy vegetables								
Squash and gourds								
Onion								
Garlic								
Potato								
Other								
Fruit crops								
Banana								
Mango								
Papaya								
Grapes								
Guava								
Other								
Spice crops								
Chilli								
Capsicum								
Other								
Oilseed crops								
Sunflower								
Groundnut								
Sesame								

Other								
Flower crops								
Rose								
Marigold								
Other								
Fodder crops								
Permanent grass								
Temporary grass								
Other								

.

18. **Pattern of change in Animal holding**

Dairy animal		**Number**			**Present**			**Reason for changing animal holding over the year**
					Number	**Total milk yield/yr**	**Total income/yr**	
		2000	**2005**	**2010**				
Cattle	Ind.							
	CB							
Buffalo								
Other								
Total								

19. **According to you, what major changes happened due to Urbanization**

Si no.	**Change**	**2000**	**2005**	**2010**	**2014**	**Remarks**
1	Family Education					
3	Investment					
4	Bank balance					
6	Monthly family expenditure					
7	Social participation					
8	Contact with Extension agent					
13	Others (specify)					

20. **Mention the Advantages of Peri-urban Crop and Dairy farming**

	A. Crop Farming	**Rank**
1.	Less cost in transportation of of farm produce	
2.	Easy market access to farm produce	
3.	Huge demand for fresh fruits vegetables and flowers	
4.	Remunerative price for farm produce	
5	Easy to sell produce in the peri-urban locality itself	
	B. Dairy Farming	**Rank**
1.	Availability of remunerative price for milk	
2.	Easy access to marketing of milk	
3.	High demand for fresh milk	
4.	Peri-urban dairy farming act as additional source of income	
5	Productive employment to the womenôs leisure time	
6	Easy marketability of value added dairy products	

21. **Mention the Constraints of Peri-urban Crop and Dairy farming** .

	A. Major Constraints in crop production systems	**Rank**
1.	Non ï availability of irrigation water	
2.	Non ï availability of labour for farm work	
3.	High cost of labour	
4.	Instability for farm produce price	
5	Escalating input costs	
	B. Major Constraints in Dairy production system	**Rank**
1.	Increasing incident of disease in animals	
2.	High cost of concentrate feed	
3.	Non-availability of fodder in time	
4.	Poor availability of veterinary services	
5	High cost of private extension service at farmerôs site	
6	Non-availability of land for fodder production	

22. **Predetermined questions used in FGDs.**

In each meeting posed the following predetermined questions:

1. What are the major changes you seen in your village and lifestyles of people from past 15 years due to urbanization of Bengaluru.
2. What are the major issue (positive/ negative) you are facing in farming (Agriculture and allied occupation). Do you think those are due to rapid urbanization
3. Do you think the farming is a best livelihood option in response to urbanization? If yes, why? If no why?
4. What are the major factors that influence you to take the decision to sale your land and you are satisfied after selling your land?
5. What are the opportunities you noticed other than farming related from the urbanization of Bengaluru, do you think those opportunities are better than farming.
6. Is there anything you want to say more on this discussion?

APPENDIX-II

Table. 1 Distribution of livestock population of Bangalore urban and Bangalore rural districts from livestock Census from 1997 to 2012.

(In numbers)

District	Year	Cattle		Total cattle	Buffalo	Total livestock
		Cross breed	indigenous			
Bangalore urban	1997	107291	77795	185086	27000	386000
Bangalore urban	2003	114606	43611	158217	14945	284402
Bangalore urban	2007	98141	28957	127098	11254	390999
Bangalore urban	2012	115941	20641	136582	8453	286512
Bangalore rural	1997*	201264	552890	754154	195000	1929000
Bangalore rural	2003*	156035	256643	412678	75635	926140
Bangalore rural	2007	114203	50655	164858	28672	472625
Bangalore rural	2012	122364	36456	158820	24381	394942

*Data for Bangalore rural from 1997 and 2003 census include Ramanagara district earlier it was a part of Bangalore rural separated in august 2007.

Source: Livestock Census, Department of Animal Husbandry & Dairying, Ministry of Agriculture.

Table. 2 Change in the total area and production of major crops of Bangalore urban district.

District	Bengaluru Urban							
Crops	2000-01		2005-06		2010-11		2013-14	
	A	P	A	P	A	P	A	P
Cereals	11135	25192	40851	102393	26900	70590	26642	82639
Pluses	9273	4000	6624	2176	4060	3320	3056	2344
Oilseeds	2998	2051	1862	1024	1210	610	465	108
Vegetables	10196	182050	2713	NA	4124	66534	794	3190
Fruits	6279	137794	4797	NA	4404	77413	4380	70026
Commercial Flowers	2169	16282	NA	NA	1089	6054	2771	13854

Note: A- Area P-Production NA-Non- available

Data of crops are in all season except red gram in pulses and rapeseed and mustard in oilseeds.

Source: Directorate of Economics and Statistics, Bangalore

Table. 3 Change in the total area and production of major crops of under Bangalore rural district.

District	Bangalore (Rural)							
Year	2000-01*		2000-01*		2010-11		2013-14	
Crops	A	P	A	P	A	P	A	P
Cereals	227399	476090	160467	356685	56280	174920	52183	136270
Pulses	37817	15000	26933	12173	8290	9000	3303	2106
Oilseeds	29380	26400	24151	22507	2120	1270	464	306
Vegetables	20730	481541	8798	NA	9286	193169	1177	5256
Fruits	28676	464438	27978	NA	13308	179304	12517	173369
Commercial Flowers	1351	8993	NA	NA	1200	5256	4614	2467

Note: A- Area P-Production NA-Non- available

Data of crops are in all season except red gram in pulses and rapeseed and mustard in oilseeds.

Source: Directorate of economics and statistics, Bangalore

Fig.1 Decrease in the agriculture land from year 2000 to 2015