

Urban Agriculture Crops and its Potentialities

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Abstract

This paper is based on urban agriculture supporting to reduce household poverty, as well as this types of agricultural production and management of crops and livestock/poultry directly help to household economy of urban or periphery area, especially to meet local needs. This paper aims to explore the urban agriculture (UA) in terms of urban food security and employment in the Kirtipur, Kathmandu. Primary data collection was done in February- April, 2023 by snowball sampling technique because of the farm owner couldn't meet at farm areas and only found the workers then collected the phone number (all respondents) and fixed the interview time then collect the data, considering the households with more than 4 Ropany (0.2 ha) of farmland as sampling units in three urban pockets- one road accessible pocket (Taudaha), second one less accessible pocket with Bhatkepati settlement, and the last one isolated pocket (Jankha), followed by observation and face to face interviews which includes total 64/64 household surveys (20 in Taudaha, 24 in Bhatkepati and 20 in Jankha) using structured questionnaire for interview schedule. The analysis of the development functions shows that most of the people in the urban area emphasized to better employment and education as well as drinking water, road, trade/ business and agricultural integration for overall development this places but lack of irrigation facilities was the most crucial problem for the development of agriculture. Other major problems include lack of modern inputs and technologies, decreased interest of youth in agricultural occupation, inadequate road network and financial problems. The organizations supporting agricultural activities and the potentials of integrated development of agriculture in Kirtipur has been assessed and analyzed with suggestions and recommendations for reducing urban poverty and food insecurity. The major suggestions include promoting irrigation facilities; market oriented organic vegetable production; in-depth study for fruit growing and beekeeping promotion; and strengthening agricultural extension services with proper sustainable urban farming policies for promoting urban food security and employment.

Keywords: *Agriculture Production, Reduce, Household Poverty, Involves, And Urban Agricultural Potentialities.*

Introduction

Nepal is a small landlocked country wedged between two large Asian countries, namely, China from north and India from east, west and south. It has total land area of 147181 sq. km with a population of 24.73 million. It is situated between 26°22' to 30°27' north latitude and 80°4' to 88°12' east longitude, along the southern slope of Himalayas to the plains. Its rectangular shape covers a length of 885 km east to west and an average width of 193 km north to south. Varieties of climate ranging from the subtropical to alpine are present in Nepal. The topography varies from the plain of Terai with an elevation of 300 mail to over 8000 m. in the altitude with Sagarmatha, (Mt. Everest, 8848 m.) as the highest point. Nepal is ethnically diverse Secular kingdom. It is home to several races, languages and religions. Politically the country is divided into seven provinces, 14 zones and 77 districts. Ecologically Nepal has been divided into Mountain, Hill and, Terai belts. The Terai belt consists of about 23 percent of the land whereas the hill and mountains consist of 42 and 35 percent of the area, respectively. The Terai belt shares a large chunk (56 percent) of cultivable land (CBS, 2021). Nepal falls in the list of least developed countries according to its development indicators. Higher rate of population growth has been conceived as one of the key factors to this poor performance. As a result, poverty is pervasive.

Kritipur municipality is one of the traditional urban settlements in the north of Katmandu valley. Presently, Kirtipur is one of the historical cities dominated by Newar community, which was declared as municipality among 58 municipalities under the Municipal Act in 2053 Chaitra 14 B. S. within the Kathmandu valley. It

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is situated 5 km south-west of Kathmandu Metropolitan city. It is also known as the city of glory, as it is one of the old and typical Newar settlements of the valley. It lies at 27° 40' 41" north, 85° 16' 37" East with altitude ranging from 1284m to 1524m above mean sea level (Kritipur Municipality report, 2024). It was declared as a municipality in 1997 by combining eight contemporary village development committees namely Palifal, Layaku, Bahirigaon, Chithubihar, Champadevi, Bishnudevi, Balkumari and Chovar. Administratively, Kirtipur Municipality has 19 wards covering 14.76 sq. km area. It is encircled by Bagmati River in the East, Chandragiri Municipality in the West, Kathmandu Metropolitan City in North and Dakchhinkali Municipality in the South.

Agriculture and Nepalese Economy

Agriculture is the backbone of the Nepalese economy. More than 65 percent of the Nepalese population engages in agricultural occupation. Agriculture in general is basically a rural based occupation. About 85.8 percent the population in the country lives in the rural area (CBS, 2003) and agriculture continues to be dominant sector in the Nepalese economy. Agriculture extends employment opportunities (full and partial) to 80 percent of the population (AEC, 1998). The development and enhancement of the productivity of this sector plays vital role in the productive employment generation and improving economic development of the country.

Performance of Nepalese Agriculture sector is not encouraging. During mid seventies Nepal was known to be the food exporting country. The share of agriculture gross domestic product (AGDP) is decreasing overtime. Considering the fact, the government has launched 20 years strategic plan, Agriculture Perspective Plan (APP) to bring about acceleration at growth in agriculture sector. APP seeks to raise agriculture GDP growth from 2.96 percent in 1992-1995 to 4.88 percent by 2011-2015 (APPRSC and JMA, 19995).

Agriculture is the mainstay of majority of Nepalese people which provides employment, foods and shelter. However, the investment in agriculture is not encouraging, received only about 3 percent of total government outlays during 2002 to 2014. In the study, Gross Domestic Product was regressed with Domestic Savings, Government Expenditure on Agriculture and Foreign Direct Investment on Agriculture with the data from FY 2002/03 to 2014/15. Regression reveals the degree of association among these variables is significant at 5 percent level of significance ($R=0.991$, $P=0.005$). The analysis showed that the contribution of Government Expenditure on Agriculture to Gross Domestic Product was found significant whereas the Domestic Savings and Foreign Direct Investment on Agriculture were found insignificant. The compound annual growth rate of Government's expenditure was found to be slightly lower than that of budget allocated to Ministry of Agricultural Development. In sum, the study concluded that the Government Expenditure on Agriculture is crucial for the national economy (Adhikari, 2015).

In 2022, the agriculture sector's contribution to GDP stood at 23.95%, whereas the manufacturing sector contributed 14.3% to GDP. In the year 2000, approximately 75% of the total population in Nepal relied on the agricultural sector for their livelihood then, by 2022 it decreased to 66% (National Statistics Department (NSD), 2021).

Urban Agriculture

The term 'urban' refers to the over-crowded, more developed and facilitated area and urban settlement is civilized one more advanced than rural. The agriculture is supporting urban life in many ways. Tangible benefits from agriculture include food, fiber, fodder, fuel wood, and building materials and so on. Environmental and social benefits relate to public health, recreation, and well being of the urban population. Urban agriculture (UA) refers to the production and management of crops, poultry and/or livestock products in the urban or periphery area, especially to meet local needs, including urban greenery management. There are two broad options for urban employment- agricultural and non-agricultural. UA is an option for employment and income generation for the low skilled, low education, poor and marginalized people, especially the migrants in urban areas. As the agriculture is the total way of life supporting system,

UA should be achieved in such a way that it is supportive to reduce poverty and food insecurity and to be market and technologically driven so as to enhance overall productivity of the marginalized urban farmers.

Residents of cities and towns have practiced urban agriculture ever since humans began to live in them. Recently, there has been a revival of interest in it because of the potential of urban agriculture to improve food access, and security for the residents, and sustainability of the urban areas. Urban agriculture has a lesser impact on the land and environment than conventional agricultural practices. It also supports community building and enhanced social interactions. Urban agriculture can take place in building balconies and rooftops, residential yards, and sometimes in vertical structures inside the buildings, and also in community gardens. It supports food security, and promotes individual productivity, facilitates community building and promotes environmental and economic sustainability. Urban farming may be conducted through hydroponics, aquaponics, vertical farming, and a more space-efficient agro-practice. Urban farming produce is typically for private consumption by the producers but can also be for commercial purposes (Replica, 8th August, 2023).

Agriculture, a pillar of human society, is undergoing dramatic changes as a result of global urbanization trends. Urban and peri-urban agriculture emerges as a critical method, providing numerous benefits such as increased food availability, poverty alleviation, and environmental mitigation. The Kathmandu Valley is the center of this study, which investigates the status and impact of urban agriculture on its population. It digs into topics including land availability, agricultural practices, food production, and health consequences. The study surveyed 230 families using a structured questionnaire method, indicating a male predominance (56%) and a diverse ethnic representation. The key findings show that 51% of respondents have access to growing areas, while 76% choose kitchen gardening. The biggest motivations are economic considerations (50%) and personal satisfaction (20%). Participants report cultivating 55% of their diet, which contributes to good health. Despite obstacles such as plant diseases (40%), 95% of respondents are satisfied with urban agriculture. This study sheds light on the potential of urban agriculture in solving Kathmandu's difficulties and offers actionable recommendations for the sustainable implementation of urban agriculture in urban settings (Waiba1, et al. 2024).

This paper analyzes the urban agriculture at Kirtipur in Kathmandu in a systematic approach for its contribution to the urban income and nutrient supply as well as to analyze how to support for the poverty reduction of urban settlement and also supply the necessary food and vegetables. It is direct support to increase households' economy as well as to generate employment of urban people.

Objectives

To find out the attitudes of the urban people towards agricultural occupation.

To explore the urban agricultural crops support to reduce the household poverty.

Limitations of the Study

This paper examines the role of urban agriculture to generate employment and income along with social, economic, nutritional supply and environmental impacts or implications as well as analyze the attitudes of the urban people with regard to increasing agricultural production, with identification of the organizations involved in supporting to agriculture development activities in the selected areas. This paper developed only based on 64 respondents by the snowball sampling method and based on one municipality (Kirtipur) of Kathmandu district so it can't generalized all Nepal urban agricultural areas. The output of the data do not have an immense scope in regional planning and policy formulation for integrated rural-urban development because of small sampling units.

Methodology

This area is a typical urban periphery with an immense agricultural potentiality. The main source of primary data by applying the snowball sampling technique in three urban pockets. The selected three urban agriculture pockets are:

- First one road accessible pocket (P₁) – Taudaha Kirtipur, Ward No. 6.
- Second one less accessible pocket with human settlement (P₂)-Bhatkepati-4.
- Last one isolated pocket (P₃) – Jankha, Kirtipur - 5.

This paper based on primary as well as secondary source of data and information. The main sources of primary data include snowballing sampling survey and visual observations. Primary data collection was done in February- April, 2023 by snowball sampling technique because of the farm owner couldn't meet at farm areas and only found the workers then collected the phone number (all respondents) and fixed the interview time then collect the data, considering the households with more than 4 Ropany (0.2 ha) of farmland as sampling units in three urban pockets- one road accessible pocket (Taudaha), second one less accessible pocket with Bhatkepati settlement, and the last one isolated pocket (Jankha), followed by observation and face to face interviews which includes total 64/64 household surveys (20 in Taudaha, 24 in Bhatkepati and 20 in Jankha) using structured questionnaire for interview schedule. The secondary data/information include reports, documents, maps, journals, books, etc published by various institutions and organizations. Direct interviews with farmers was carried out by using structured questionnaire applying snowball sampling technique, considering a household with more than 0.2 ha of farmland in three urban pockets as a sampling unit; visual observation by using structured observation-sheet in the selected pockets. The total number of 64 households' surveyed and visual observations of farming site and information obtained from the farmers' interviews and the researcher's observation basically on the family size, housing types (roofing patterns) and awareness (training obtained) in the agricultural technology. Landholding pattern of the farm families, average size of landholding (owned as well as rented land for cultivation) by the farm households was calculated with comparative analysis in the selected pockets under the study. All the information collected during study process, including quantitative information were coded and tabulated. Simple statistical tools and techniques were employed for appropriate processing and analysis, further supplemented by different computer software packages like WORD, EXCEL /SPSS.

Results and Discussion

Employment Pattern

Based on observation, the variation in employment (%) was computed and farmers' responses in this concern were analyzed. The principal sectors of employment in the study area were agriculture, service sector, trade/business, waged labor and foreign employment. Table 1 describes the gender wise comparative employment patterns of the farm families in the three selected pockets under the study.

Table 1. Employment Patterns of the Farm Families in Kirtipur

Sector	Variations in employment (%)								
	Kirtipur Taudaha (HH = 20, n = 190)			Bhatkepati (HH = 24, n = 161)			Jankha (HH = 20, n = 145)		
	Female	Male	Total	Female	Male	Total	Female	Male	Total
Agriculture	25.26 (48)	25.79 (49)	51.05 (97)	29.81 (48)	22.36 (36)	52.17 (84)	25.52 (37)	20.69 (30)	46.21 (67)
Service sector	2.10 (4)	4.21 (8)	6.31 (12)	1.24 (2)	1.24 (2)	2.48 (4)	0.00 (0)	3.45 (5)	3.45 (5)
Trade/business	1.58	4.44	3.68	1.24	4.35	5.59	0.00	0.69	0.69

	(3)	(4)	(7)	(2)	(7)	(9)	(0)	(1)	(1)
Waged labor	1.05 (2)	7.37 (14)	8.42 (16)	0.00 (0)	7.45 (12)	7.45 (12)	1.38 (2)	8.97 (13)	10.35 (15)
Foreign employment			3.16 (6)			4.35 (7)			1.38 (2)

Source: Field Survey, 2023

- HH= The total number of household surveyed;
- n = Total population surveyed.

The analysis, thus, comes to the conclusion that the variations in employment opportunities in terms of agriculture, service sector, trade/business, waged labor and foreign employment, in general, was not significant in the three selected urban pockets. The substantial role of women in the urban farming system in Bhatkepati area as followed by similar proportion of Jankha and Taudaha, which is likely with the study results reported by Timsina (1992). And, likely with the report of Devkota and Rauniyar (1999), the findings supports the hypothesis that differences in gender and ethnic roles need to be accounted for urban agricultural policy formulation and planning.

Landholding Pattern

Maximum size of landholding was observed to be 60 Ropany in Bhatkepati and most of the land was un-irrigated upland. Landholding pattern in the three pockets of study area has been comparatively described. There are owned, rented and total landholding were 6.167, 1.083 and 7.167 Ropanies respectively. Thus, in terms of landholding patterns in this areas, inequalities were observed. The landholding sizes are not equal because of rented land is more costly for the agricultural farm (rent, labour, transportation and production) in Kritipur.

Attitude of the Urban People Towards Agricultural Occupation

The variations in the employment patterns of the urban people in terms of agriculture and non-agricultural occupation functions. Farmer's responses with regard to agriculture as a profession were tested by collecting and analysis of data on their engagement pattern in agriculture. Majority of the farmers responded that agriculture was the principal source of income and employment for their family.

Table 2. Farmers' Responses to Agriculture in Terms of Employment.

Response to agriculture	Frequencies of farmers (%)			
	Taudaha, P ₁ , (n=20)	Bhatkepati, P ₂ , (n= 24)	Jankha, P ₃ (n =20)	Mean (n =64)
As full employment	35.00 (7)	54.17 (13)	55.00 (11)	48.44 (31)
As partial employment	50.00 (10)	41.67 (10)	45.00 (9)	45.31 (29)
As additional income source	10.00 (2)	4.17 (1)	0.00 (0)	4.69 (3)
As means for using spare time	5.00 (1)	0.00 (0)	0.00 (0)	1.56 (1)

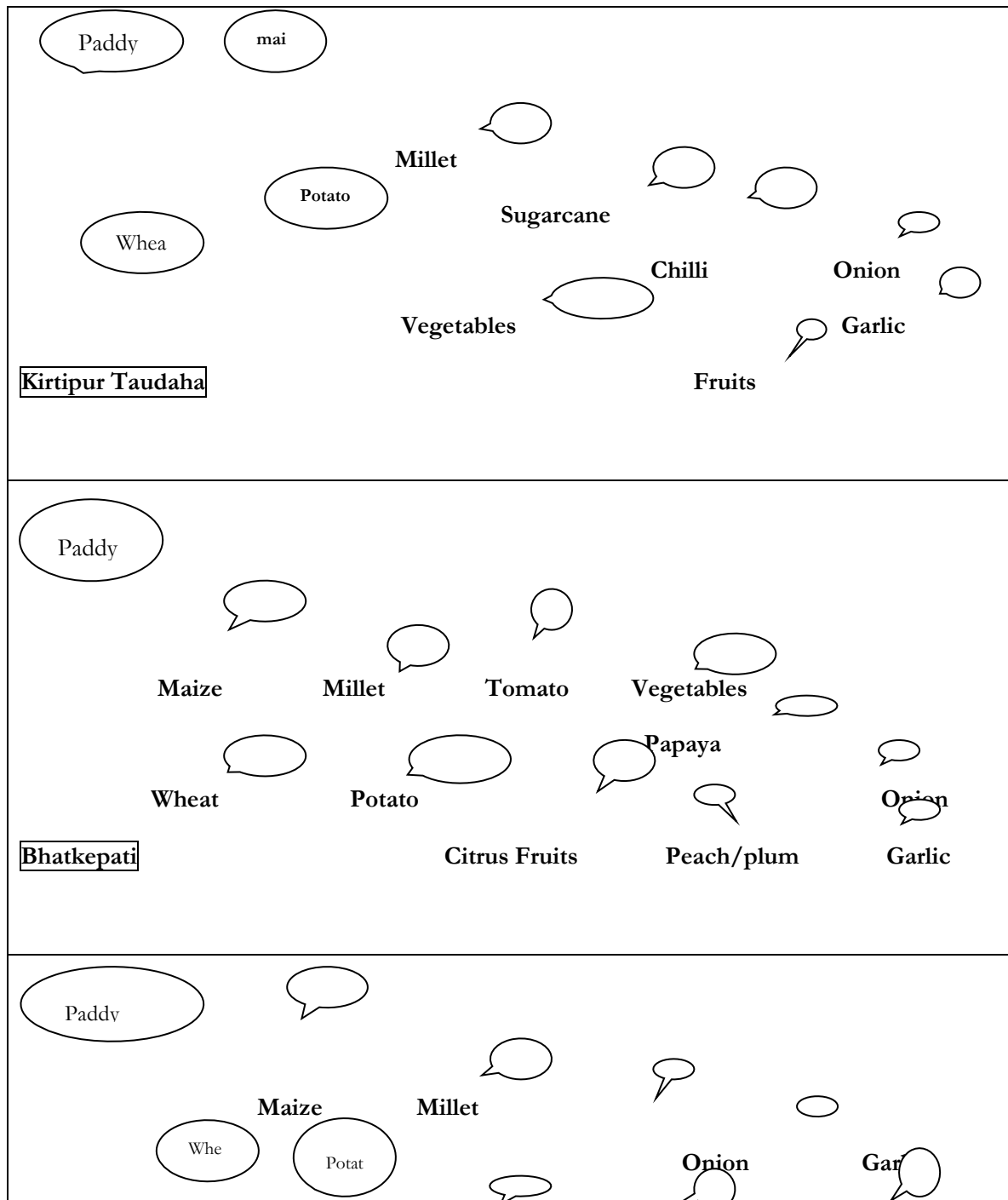
Source: Field Survey, 2023

The access to facilities including road and market is conducive to the farmers for searching other alternatives to agricultural occupation. As a result, there might be low percentage of households having agriculture as full employment and more people adopt agriculture as partial employment but market oriented production. Contrary to this, if the pocket is isolated with less access to facilities required, higher percentage of people remain in subsistence agriculture with lesser search for other alternatives and market oriented production.

Major Crops and Cropping Pattern

The major crops grown observed and reported in the study area include paddy, wheat, maize, potato, sugarcane, millet, chilly, onion, garlic other vegetables and very few fruits. In Kirtipur area, very few fruit crops were observed, except in the Bhatkepati area, where some farmers are growing some fruits. The crops observed or reported to be grown in the three pockets studied in Kirtipur have been presented in figure 1. Major cropping patterns being adopted in the study area has been presented in Table 3.

Figure 2. Major Crop Types Grown in Kirtipur Area.



	Fruits	Vegetables
Chilli		
Jankha		

Table 3. Major Cropping Patterns Adopted By the Farmers in Kirtipur

Study Area	Major Cropping Patterns	
	Lowland	Upland
Taudaha	<ul style="list-style-type: none"> • Paddy – Wheat • Paddy – Wheat – Maize 	<ul style="list-style-type: none"> • Maize– Paddy (Ghaiya)- Millet • Maize – Vegetables • Maize – Millet
Bhatkepati	<ul style="list-style-type: none"> • Rice – Wheat • Paddy – Vegetables • Paddy – Wheat – Potato 	<ul style="list-style-type: none"> • Maize – Millet • Maize - Paddy (Ghaiya) • Fruits (Citrus fruits, Papaya, Peach/Plums, Pear, etc.)
Jankha	<ul style="list-style-type: none"> • Paddy – Wheat • Paddy – Potato 	<ul style="list-style-type: none"> • Maize – Millet • Maize – Wheat

Source: Field Survey, 2023

Out of total respondents, 15.6% of the farmers have not knowledge about nutrition requirements. The observed data on the nutrient supply patterns to the urban farmers strongly supports the hypothesis that nutrient required to the poor urban farmers are basically supplied from the farm products.

Table 4. Patterns of Nutrition Supply to the Urban Farmers in the Study Area

Nutrient Supply Pattern	Maximum Occurrence (%)			
	Taudaha, P ₁ , (n = 20)	Bhatkepati, P ₂ , (n = 24)	Jankha, P ₃ , (n = 20)	Mean
Purchasing from others	68.30	75.00	83.67	75.38
Consuming own farm product	56.70	72.00	75.00	68.20
Selling over surplus	25.00	43.06	30.00	33.33

Source: Field Survey, 2023

The nutritional supply to urban farmers in Kirtipur. Similar type of study carried out in Chitwan suggests that social and economic variables such as size of landholding, income and employment structure of households are positively related to the nutritional status (Bhandari, 1985).

Production Trend in Agriculture

Agricultural productivity in the study area seems to be decreased as compared to the production in the past. Among the 64 farm households surveyed, 75% of the farmers responded that their farm production is in decreasing trend. Whereas, 12.5 % responded that agricultural production is increasing, and, 12.5% responded that there is no any change in agricultural productivity.

Agricultural integration potentialities

The comparative potentials of agricultural integration in the three selected study areas based on farmers scoring indices in the respective agricultural component enterprise. The study shows that the highest potentiality in the areas include growing agronomic crops (mainly paddy, wheat and potato and maize), followed by integrating livestock and poultry farming.

Table 5. Agricultural Integration Potentialities in the Kirtipur Area

Agricultural Enterprises	Observed Score (Respondent %)			
	Taudaha, P ₁ , (n = 20)	Bhatkepati, P ₂ , (n = 24)	Jankha, P ₃ , (n = 20)	Mean
Agronomic crops (mainly paddy, wheat, potato and maize)	75.00	100.00	100.00	91.66
Poultry farming	70.00	79.20	65.00	71.40
Cattle /buffalo rearing	65.00	75.00	62.50	67.50
Goat /sheep rearing	52.5	56.25	42.5	50.40
Home gardening (fruits & vegetables)	80.00	91.00	70.00	80.33
Commercial fruit farming	0.00	29.20	0.00	9.66
Commercial vegetable farming	30.00	29.00	15.00	24.66
Floriculture	5.00	8.30	0.00	4.43
Beekeeping	0.00	4.20	0.00	1.40
Mushroom farming	35.00	4.20	5.00	14.73

Source: Field Survey, 2023

Some agricultural production components are also observed as significantly correlated with the certain factors- such as landholding, irrigation and farmers' knowledge and skills. Table 5 presents some correlations between different agricultural factors and components as revealed from the present study.

Table 6. Correlation Coefficient Matrix of Some Agricultural Factors and Production Components

Parameters	Land holding	Cereal production	Vegetable productivity	Irrigation problem
Land holding	1.000			
Cereal productivity	-0.423 **	1.00		
Vegetable productivity	-0.318 *	-0.289*	1.00	
Irrigation problem	0.109	-0.293*	0.231*	1.00

Source: Field Survey, 2023

(Function: MULTIREG; Data case: 1 to 64)

* Significant at 0.05 level and 63 degrees of freedom

** Significant at 0.01 level and 63 degrees of freedom

Thus, likely as reported by Upreti *et al.* (2000-2001), the present finding supports the hypothesis that irrigation has substantial contribution to sustaining agricultural productivity, economy and food security under present Nepalese context. The analysis revealed the empirical relationship that there is a significant negative correlation between the landholding and the productivity of cereals as well as vegetable crops. At the same time, the problem of irrigation seems to be the most crucial bottleneck for the production and productivity of the crops.

A multiple linear regression model ($Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2$) was fitted describing the relationship of paddy yield (Y) with the irrigation problem index (X_1) and the number of animals domesticated (X_2), as follows.

$$Y = 49.99 - 4.62 X_1 + 3.13 X_2 \dots\dots\dots(4)$$

The regression was significant (p-value = 0.005) with the coefficient of determination (R^2 -value) 0.158 (where adjusted R-Square and the standard error of estimates were 0.130 and 9.754). This indicates that 16% variation in paddy production (yield) can be expected by the effect of irrigation problem and number of animals domesticated by the household.

However, among the two regression coefficients (β_1 and β_2), β_2 (the coefficient of X_2 , the number of animals domesticated) was not significant (p = 0.376). This indicates that the linear relationship may not always exist between the yield and the number of animals domesticated. And, there might be some quadratic relationships between the number of animals domesticated and paddy yield.

Similarly, another multiple linear regression model ($Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2$) was also fitted describing the relationship of vegetable production (Y) with Location- inaccessibility index (X_1) and irrigation problem index (X_2), as follows.

$$Y = 15.55 + 3.65 X_1 - 1.45 X_2 \dots\dots\dots(5)$$

The regression was significant (p-value = 0.000) with the coefficient of determination (R^2 -value) 0.259 (where adjusted R-Square and the standard error of estimates were 0.235 and 6.392). This indicates that 26% variation in vegetable production can be expected by the difference in location (inaccessibility) and irrigation problem.

Conclusions

Urban agricultural contributed for the economic well-being of urban and peri-urban farmers for their livelihood and poverty reduction. It examined the role of urban agriculture to generate employment, nutritional supply and socio-economic status. This also analyzed the attitudes of the urban people with regard to increasing agricultural production, with identification of the organizations involved in supporting to agriculture development activities in the study areas. Kirtipur is an ancient and historical city highly potential for the development of urban agriculture. Based on the observed scenario, market oriented agricultural production, and at present includes vegetables, milk and poultry products. At the same time, there is an immense potentiality for the development of beekeeping, mushroom farming, cereal production and vegetable farming and floricultural enterprises. However, there are some problems in order to grasp with such potentialities. The most critical problems of agricultural development include the inadequate irrigation facilities, less developed road network and infrastructural facilities including storage structures and inadequate technical support to the farmers. All farmers in Kirtipur are mainly depending on agrochemicals (chemical fertilizers, and pesticides) for crop production and concept of organic farming has not been introduced. In this regard, agriculture in this area need to avoid crop contamination, environmental pollution by farming practices in order to attract urban consumers with better health and environment. At the same time, national policy makers need to develop a sustainable food growing policy, encompassing financial, technical and other supports, including research, for promoting urban agriculture, specially for reducing urban poverty through urban food security and employment generation. The strategies are needed to further promote private initiatives in urban farming.

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