

Economics of Peri-Urban Agriculture

Case of Magadi Off Bangalore

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Peri-urban agriculture has brought out two clear impacts on farmers and the rural economy. The first is the long-term impact of rise in land prices associated with reduced size of holding for agriculture, and the second, the short-term impact of rise in agricultural wages. In peri-urban and rural agriculture, the contribution from wage income exceeds 50%. Nevertheless, the per capita incomes of farmers in these scenarios are 50% lower than the per capita income of an average Indian. Steps are suggested to improve the economic situation of peri-urban farmers.

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This study analyses and compares the income, employment and standard of living of farmers in peri-urban agriculture. The town chosen for this study, Magadi, is 25 km from Bangalore and is connected to it by a road from Sunkadakatte, which is in a state of disrepair. Magadi was chosen for two reasons. One, Magadi represents a truly peri-urban set-up with a strong agricultural base, including livestock. Two, the Resource Centres on Urban Agriculture and the Food Security-International Crops Research Institute for the Semi-Arid Tropics (RUAU-ICRISAT) have established the Magadi Carrot Growers' Association to promote collective action in producing, collecting, transporting, storing, packing, grading, sorting and marketing carrots.

The data for this study are drawn from a pretested schedule administered to a random sample of 50 farmers in an area with high urban influence and 50 farmers in an area with low urban influence, both in Magadi town. The farms with high urban influence (FHUI) were small-sized holdings in Hombalammanapete, while the farms with low urban influence (FLUI) were in Tirumale, Someswara Colony, Kalya Gate and other parts of Magadi. As a control group representing rural agriculture, 21 farmers on farms with no urban influence (FNUI) in Jenukallu village, about 20 km from Magadi, were chosen. The FNUI, which cultivated ragi and horse gram, were totally rain-fed and the farmers on them were largely dependent on income from agricultural labour in neighbouring villages. The data collected included, inter alia, cost and returns from producing all the crops on the farm, including livestock, land values, irrigation source and costs, land sales, savings, investment, wage rates, and so on.

The per capita net income of FHUI farmers was Rs 7,017, of FLUI farmers Rs 17,452 and of FNUI farmers Rs 8,112. Thus, FLUI farmers had the highest per capita income due to their higher off-farm income (Rs 58,596, forming 71%). The per capita monthly health expenditure was higher for FHUI farmers (Rs 137) compared to FLUI farmers (Rs 98) and FNUI farmers (Rs 8), which shows the relative vulnerability of peri-urban farmers (Table 1, p 76). In Magadi, people suffer from cardiac problems, diabetes and high blood pressure (BP)-related ailments.

The per capita net income of the three groups shows that access to water and urban or peri-urban farming are only necessary conditions for realising a higher income, but not sufficient conditions. The FNUI farmers enjoyed higher per capita incomes than FHUI farmers because their labour earned them high wages. The gross income per acre was highest among FHUI farmers (Rs 22,422) compared to FLUI farmers (Rs 5,234) and FNUI farmers (Rs 3,194).

Cropping Pattern

The area devoted to each crop was relatively small in FHUI compared to FLUI as the overall size of holdings is small. The average size of FHUI holdings (0.29 acre) is 85% smaller than FLUI holdings and is 66% smaller than FNUI holdings. In FHUI, 20% of the gross cropped area was devoted to ragi, followed by radish (16%), knol khol (14%), green leafy vegetables (12%), China aster, carrots and beans (7% each) (Table 2, p 76).

Economics of Farming

The FHUI, FLUI and FNUI are all located in and around Magadi, a peri-urban area close to Bangalore city. The net farm income from agricultural crops and livestock is Rs 23,780 for FLUI, followed by Rs 17,607 for FHUI and Rs 6,651 for FNUI. For every one rupee of net income from crops and livestock, the off-farm income is Rs 2.46 in FLUI, Rs 1.17 in FHUI and Rs 4.17 in FNUI. This shows that in peri-urban agriculture, off-farm income in terms of employment in urban and peri-urban areas, largely in civil works, is higher than the income from agriculture.

NOTES

Table 1: Socio-economic Features of Farmers in Magadi Peri-Urban Agriculture

Category	FHUI	FLUI	FNUI
Family size (number of members)	5.44 (2 to 15)	4.72 (2 to 18)	4.24 (2 to 14)
Net returns per farm from agriculture (Rs)	11,978 (31%)	10,432 (13%)	3,194 (9%)
Net returns per farm from livestock (Rs)	5,629 (19%)	13,348 (16%)	3,457 (10%)
Net income per family from off-farm employment (Rs)	20,568 (54%)	58,596 (71%)	27,743 (81%)
Net income per family from all sources (Rs)	38,175 (100%)	82,376 (100%)	34,395 (100%)
Per capita income (Rs)	7,017	17,452	8,112
Annual health expenditure per family (Rs)	8,964 (600 to 92,000)	5,552 (300 to 84,000)	384 (120 to 1,200)
Major illnesses suffered	Heart problems, BP, diabetes, eye problems, stroke and headache	Diabetes, BP, heart problems, stroke and headache	No major problems were identified
Disability adjusted life years	5.6 (0.5 to 12)	6 (1 to 14)	0
Literacy (%)	67.033	72.034	28.09
Net income per farm family from agriculture and livestock (Rs)	17,607	23,780	6,652

Figures in parentheses give range. The denominator chosen to compute figures per family refers to the actual number of families possessing or holding the respective feature. FHUI = farms located where there is high urban influence (Hombalammannapete), FLUI = farms located where there is low urban influence (other areas in Magadi), FNUI = farms located where there is no urban influence (Jenukallu).

Source: Primary data from sample farmers.

Table 2: Cropping Pattern of FHUI, FLUI and FNUI Farmers

Crops	FLUI			FHUI			FNUI		
	Area (Acres)	Production (qtl)	Price (Rs/qtl)	Area (Acres)	Production (qtl)	Price (Rs/qtl)	Area (Acres)	Production (qtl)	Price (Rs/qtl)
Aravesoppu (Greens)	0	NA	NA	0.8 (3.36)	132	1,068			
Beans	0.375 (0.354)	7		1.65 (6.93)	23.5	1,504			
Bananas	3 (2.83)	25	1,200	0	NA	NA			
Bitter gourd	0.65 (0.613)	31	1,500	0	NA	NA			
Cabbages	0	0	0	0	NA	NA			
Carrots	0	0	0	1.6 (6.96)	41.75	1,252			
China aster	0.79 (0.74)	6.8	3,589	1.65 (7.17)	22.85	3,676			
Chrysanthemum	0.25 (0.24)	3.5	5,771	1 (4.35)	25.6	5,662			
Cauliflowers	0	0	0	0.5 (0.21)	10	1,200			
Fodder crops	4.25 (4.01)	107	NA	0.8 (3.36)	40	NA			
Green leafy vegetables	0	0	0	2.8 (11.76)	367.5	2,500			
Groundnut	1 (0.95)	4	2,500	0	NA	NA			
Horse gram	9.125 (8.61)	47.5	1,500	0	NA	NA	1.95 (10.94)	12	12,085
Knoi kohlr	0	0	0	3.375 (14.18)	23.85	2,280			
Ladies fingers	0	0	0	0.25 (0.105)	6	1,553			
Mulberry	1.5 (1.45)	0.9	1,500	0	NA	NA			
Paddy	3.25 (3.07)	24	2,389	1.25 (5.25)	16	2,750			
Ragi	75.75 (71.5)	344.5	1,017	4.75 (19.96)	25	1,000	15.88 (89.06)	70	851
Radish	0	0	0	3.825 (16.07)	17.95	1,000			
Rose	3 (2.83)	18	6,333	0	NA	NA			
Tomatoes	1 (0.95)	17	1,100	0	NA	NA			

Figures in parentheses are percentage to the gross cropped area.

Source: Primary data from sample farmers.

The off-farm income forms 54% of the total income in FHUI, 71% in FLUI and 81% in FNUI. The net income per family from all sources is Rs 38,175 in FHUI, Rs 34,395 in FNUI and Rs 82,376 in FLUI (Table 3, p 77).

Measuring the performance of FHUI, FLUI and FNUI farmers depends on the denominator used. Other than number of farm families, gross cropped area and family size, the economically rational one is per capita income, as the income is earned by different members of families

in landed activity (from crops), non-land activity (from livestock) and off-farm activity (from off-farm employment in non-agriculture and agriculture). Thus, a comparison of farms or farm families is better than the gross cropped area since all the three groups have an almost similar distribution of holdings.

Livestock: Only 12% of FHUI families had draft animals, at a rate of two animals per family. In FLUI and FNUI, no families had draft animals. This shows that the

importance of draft animals is negligible in peri-urban agriculture. Among FHUI and FLUI, 15% had milch animals, contributing around Rs 30,550 and Rs 47,720 respectively per year per family. In FNUI (Jenukallu), 43% of the families had cows contributing around Rs 6,000 per year per family. Sheep were owned by 6% of FHUI and 3% of FLUI families, contributing Rs 5,166 and Rs 8,000 respectively per family per year. In FNUI, 14% of the families had sheep, which contributed Rs 6,000 per family per year. In FNUI, 48% of the families had goats and poultry, which contributed around Rs 8,500 per family per year.

Off-Farm Employment: In FHUI, only 45% of the farmers went in search of employment to urban areas, while in FLUI, it was 72% because the irrigated area is low. In FHUI, farmers were employed for 269 days, while in FLUI it was 307 days. In FNUI, it was 148 man-days. The monthly per capita income from labour was Rs 3,841 in FHUI, while it was Rs 5,336 in FLUI and Rs 981 in FNUI. The FHUI figure is lower than the FLUI figure because a larger irrigated area does not leave FHUI farmers with time to go in search of employment elsewhere.

Off-farm employment has assumed great importance in all three groups because it contributes to more than 50% of the total family income (54% in FHUI, 71% in FLUI and 81% in FNUI). This

indicates that as the intensity of agricultural activity (the contribution of agriculture and livestock to total income) declines (46% in FHUI, 29% in FLUI and 19% in FNUI), the degree of off-farm employment increases.

Diversity of employment is higher in FLUI than in FHUI because agriculture and livestock provide only 29% of the total income. In FHUI, agriculture and livestock provide 46% of family income and the level of employment provided by agriculture and livestock is much higher. In

Table 3: Economics of Farming in Magadi Peri-Urban Area

Characteristics	FHUI	FLUI	FNUI
Sample size = n (number of farmers)	50	50	21
Total net cropped area (acres)	14.7	98.33	17.83
Total gross cropped area (acres)	23.8	106	17.83
Net cropped area per farm (acres)	0.29	1.97	0.85
Gross cropped area per farm family	0.48	2.12	0.85
Total gross income per year (Rs)	15,57,179	10,86,000	1,14,300
Total cost of cultivation of all crops per year (Rs)	9,58,276	5,64,390	47,214
Total net returns from all crops per year (Rs)	5,98,903	5,21,610	67,086
Total income from milch animals per year	3,66,600	10,27,840	55,000
Total cost of rearing milch animals per year	1,46,640	411,136	22,000
Total net return from milch animals per year	2,19,960	616,704	33,000
Total income from sheep, goats per year	1,02,500	84,500	99,000
Total cost of rearing sheep, goats per year	41,000	33,800	99,000
Total net returns from sheep, goats per year	61,500	50,700	39,600
Total income from off-farm employment per year	10,28,400	29,29,800	5,82,600
Total net income from all sources (Rs)	19,08,763	4,118,814	7,22,286
Net income per acre from all sources (Rs)	80,200	38,857	40,510
Market value per acre (Rs/millions)	2.16	1.165	0.0678
Net returns per farm from agriculture per year	11,978	10,432	3,194
Net returns per acre per year from agriculture	25,164	4,920	3,763
Net return from milch animals per farm family	4,399	12,334	1,571
Net return from sheep and goats per farm family	1,230	1,014	1,886
Net return from livestock per farm family	5,629	13,348	3,457
Net income from off-farm employment per farm	20,568	58,596	27,743
Total net income from agriculture and livestock per farm	17,607	23,780	6,652
Net income from all sources per family year	38,175	82,376	34,395
Ratio of agriculture and livestock net income to off-farm employment	1 : 1.17	1 : 2.46	1 : 4.17
Percentage of income from agriculture and livestock out of total income	46%	29%	19%

The cost of rearing milch animals, sheep and goats are assumed to be 40% of their corresponding gross income.
Source: Primary data from sample farmers.

a sharp contrast, in FNUI, agriculture and livestock provide only 19% of the family income, which offers more scope for seeking employment outside farms. Thus, off-farm employment provides 81% of family income in FNUI, against 71% in FLUI and 54% in FHUI. This is a clear reflection of the fast decreasing role of agriculture and livestock in the peri-urban economy of Magadi (Figures 1, 2).

Landholdings: In FNUI, there is no leasing of land, while in FHUI, leased land is around 1.06 acres (54% higher compared to FLUI) and in FLUI, it is about 0.69 acre. In FHUI, 44% of farmers have leased-in agricultural land and in FLUI, it forms 12% of total land. In FLUI, the owned irrigated land of 0.47 acre is 24% of total land of 1.97 acres. In FHUI, the own irrigated land of 1.21 acres is 20% of total land. In both cases, the farmers had two fragments.

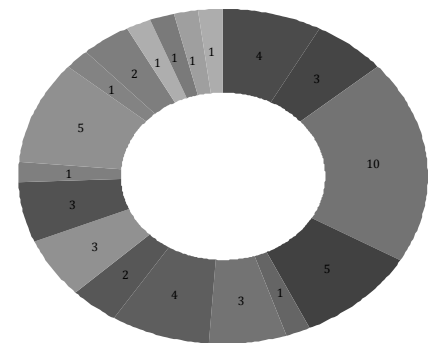
Value of Land: The value of land is skyrocketing in both absolute and real terms in the Magadi peri-urban area. The area of land sold varied widely between FHUI

and FLUI. In FHUI, the area of land sold was 0.56 acre, while in FLUI, it was 6.5 acres. For instance, the nominal price of land rose from Rs 3.11 lakh per acre to Rs 34.61 lakh per acre in nine years for FHUI, registering a compound growth rate of 30.7% per annum. In the case of FLUI, the land price rose from Rs 5.4 lakh per acre to Rs 11.38 lakh per acre, increasing at a compound growth rate of 7.23% per annum. Thus, the value of land in the FHUI area is increasing at a much faster than in the FLUI area (Table 4, p 78).

In FHUI, 10 farmers, or 20% of the sample had sold their land. The major reasons for selling land was conducting marriages (30%), followed by repayment of debts (20%), for housing (10%), drilling irrigation wells (10%), and establishing silk-twisting units (20%) and to maintain dairy cattle (10%). Of these, portfolio management applies to all but marriages, debt repayments and housing. Thus, 40% of the value of land sold was towards portfolio management and 60% of the investment made from the proceeds was non-productive. In FLUI,

Figure 1: Number Employed in Off-Farm Activities in FLUI

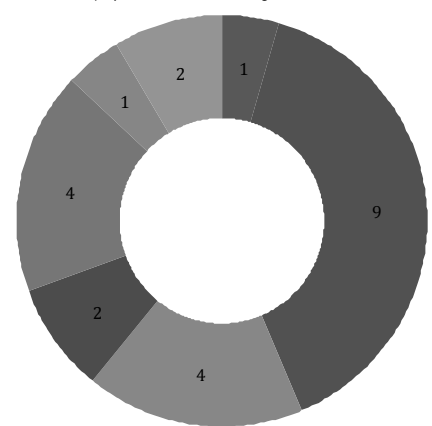
Off-Farm Employment on Farms with Low Urban Influence



(1) Agricultural labour (garden work, digging, interculturing, transplanting, harvesting, transporting); (2) labour in silk reeling units; (3) labour in urban areas; (4) teacher; (5) middleman in vegetable market; (6) retailer (stationery); (7) TV technician; (8) accountant; (9) TMC councillor; (10) carpenter; (11) lawyer; (12) driver, (13) tailor; (14) contractor civil work; (15) journalist, (16) engineer; (17) pharmaceutical distributor; (18) income tax office.
Source: Primary data from sample farmers.

Figure 2: Number Employed in Off-Farm Activities in FHUI

Off-farm Employment on Farms with High Urban Influence



(1) Agricultural labour (garden work, digging, interculturing, transplanting, harvesting, transporting); (2) labour in silk reeling units; (3) labour in urban areas; (4) teacher; (5) middleman in vegetable market; (6) retailer (stationery); (7) TV technician; (8) accountant; (9) TMC councillor; (10) carpenter; (11) lawyer; (12) driver; (13) tailor; (14) contractor civil work; (15) journalist; (16) engineer; (17) pharmaceutical distributor; (18) income tax office.
Source: Primary data from sample farmers.

three farmers, or 6% of the sample, had sold their land. The proceeds were used for house construction and marriages. Thus, in FLUI there was no investment made for productive purposes.

In FHUI, only 40% of the proceeds was invested in productive purposes, while in FLUI, it was nil. In FNUI, there was no incidence of land sale as the village is in a remote location with no motorable road to it. This calls for commercial banks, cooperatives and the departments of agriculture and horticulture, including animal husbandry, educating

Table 4: Details of Land Sold in Magadi Peri-Urban Agriculture Area

Particulars	FHUI Farmers (50)	FLUI Farmers (50)	FNUI Farmers (21)
Percentage of farmers who sold land	20	6	0
Land sold (acres) (range)	0.56 (0.15 to 1)	6.5 (1.5 to 12)	No incidence of land sale
Number of years since land sale (range)	8.7 (6 to 21)	10.67 (10 to 12)	Not applicable
Portfolio management: Prime reason/s for land sale	Silk twisting unit (20%), dairy cattle (10%)	House construction (33%)	Not applicable
Sale value of land (Rs/acre)	3,11,211	5,40,103	Not applicable
To whom land was sold	Neighbouring farmer	Neighbouring farmer	Not applicable
Price of the land sold in 2009 (Rs/acre)	34,61,883	11,38,462	Not applicable
Compound growth rate in land value	30.7%	7.23%	Not applicable

Figures in the parentheses are range. Source: Primary data from sample farmers.

Table 5: Estimated Hedonic Pricing Model of Agricultural Land in Urban Area and Remote Village in Magadi

Variables	Coefficients	Standard Error	t-Stat
Intercept	0.1398842	2.771485	0.504727
FHUI	1.823239	3.804313	4.792557
FLUI	1.126191	3.437989	3.275725
Own irrigation well	0.5739962	2.65626	2.160918
Buying water for irrigation (Water market)	0.1257644	3.347125	0.375739
Distance of the fragment from the centre (metres)	-0.000403	0.001235	-3.26177

FHUI are given (1, 0) dummy variable values; FLUI are given (0, 1) dummy variable values, while FNUI are given (0, 0) dummy variable. Similarly, farmers owning own irrigation wells are assigned dummy variable values of (1, 0), while farms buying groundwater for irrigation are assigned (0, 1) and farms with no irrigation are assigned (0, 0) values.

farmers on the investment opportunities available in their areas.

Estimated Price of Land in Magadi

The estimated linear hedonic pricing model of land has an $R^2 = 0.3237$, and is significant with $n = 147$ (observations) fragments of land (belonging to 121 sample farmers). The coefficients for FHUI, FLUI and the intercept are significant along with that for buying water, while the distance coefficient is not statistically significant. In FHUI, the average distance of a fragment from the centre is 502 metres, while in FLUI, it is 692 metres. From a dummy variable regression, we need to use coefficients for further forecasting or extrapolating the dummy variable regression.

The hedonic model is used to find the market value of agricultural land with different characteristics. The market value of FHUI is Rs 1.96 million, while that of FLUI is Rs 1.27 million. Thus, the market value varies even within Magadi town based on the degree of urban influence. The addition of irrigation wells will raise the market value of FHUI to Rs 2.53 million. However, within the urban area, the market value of land falls with the distance from the centre. Accordingly, the market value of FHUI using the distance criterion is Rs 1.76 million. The market value of land in FNUI (control village) closer to the

centre is estimated to be Rs 0.14 million and that at a distance from the centre is Rs 0.08 million (Tables 5 and 6).

The estimated values of land indicate a pattern with different factors contributing to it (Table 6). Thus, factors such as location close to the centre (of town or village), presence of irrigation wells, access to groundwater, and degree of urban influence contribute to increasing in the land value in Magadi town.

The urban influence on land market is the greatest as it adds Rs 1.82 million per acre when compared with the influence within Magadi town, which adds only Rs 0.7 million to land value. Owning an irrigation well adds Rs 0.57 million to land value per acre. Even without an own irrigation facility, if a farmer can purchase groundwater, it adds Rs 0.12 million to the land value per acre (Figure 3).

Asset Position

Considering the ergonomic benefits to women in FHUI and FLUI, the families had 60% (68%) grinding mixture, 28% (48%) cooking gas, 4% (0%) refrigerator, 52% (72%) telephone/mobile phone and 22% (18%) music systems. Considering

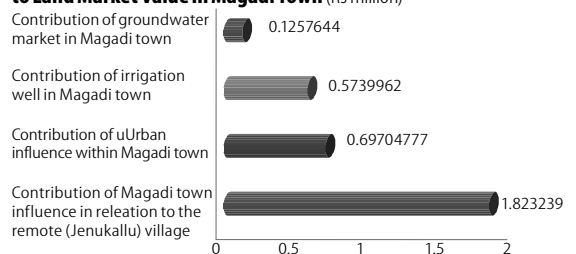
Table 6: Estimated Price of Land in Magadi Using the Hedonic Pricing Model of Land Value for Different Characteristics of Land

Factors Contributing to Land Pricing	Market Value (Rs Million)
Located in control village at average distance from village centre	0.08
Located in control village	0.14
Located in control village with water market located closer to village centre	0.27
Located in control village with irrigation located closer to village	0.71
Located in FHUI without irrigation well with distance	1.06
Located in FLUI without irrigation well with distance with water market	1.11
Located in FLUI area	1.27
Located in FLUI without irrigation well but with water market	1.39
Located in FLUI with irrigation well at average distance from the town	1.56
Located in FHUI at average distance from the centre	1.76
Located in FLUI with irrigation well	1.84
Located in FHUI without irrigation well with distance with water market	1.89
Located in FHUI area	1.96
Located in FHUI without irrigation well but with water market	2.09
Located in FHUI with irrigation well-located at average distance from the town	2.33
Located in FHUI with irrigation well	2.54

The average distance of location of land in FHUI is 502 metres, that in FLUI is 692 metres and in FNUI is 147 metres.

the commute facility in FHUI and FLUI 16% (22%) had bicycle and 36% (26%) motorcycle (Table 7, p 79).

Figure 3: Hedonic Pricing Model: Contribution of Urban Influence to Land Market Value in Magadi Town (Rs million)



Groundwater Market

The initial investment on an irrigation well is around Rs 1 lakh in Magadi. With the shrinking size of holdings and good yields from irrigation wells at around 2,000 gallons per hour, groundwater markets have emerged. The average area irrigated using purchased water in the FHUI area is 1.1 acres with an annual payment of Rs 3,785 per acre. The area irrigated with purchased water in FLUI is 0.36 acre with an annual payment of Rs 3,000 (Table 8, p 79).

Participation in Welfare Organisations:

Around 25% of the families are members of welfare organisations. This indicates their motivation to do well despite their location disadvantage and modest income levels. Remote farmers deserve greater appreciation than peri-urban ones because given incomes of around Rs 25,000 per family per year their saving level is 30%, which is more than double that of peri-urban farmers (Table 9).

Differential Wage Rate as Indicator of Economic Scarcity of Labour

The wage differential across gender indicates that wage rates differ by at least 85% within the Magadi peri-urban area. While this is not unusual, the wage rates also differ across FHUI, FLUI and FNUI.

For instance, the wage rate for a man-day is 33% higher in the FHUI over the FLUI. The wage rate for a man-day is 67% higher in the FHUI over the control village. For a woman-day, the wage rate is higher by 25% in the FHUI over the FLUI and by 33% over the control village. Thus, the wage rates are at least higher by 25% in the FHUI over the FLUI, which is due to more intense agricultural activity in the FHUI, which in turn leads to competitive wage rates (Table 10).

Conclusions

The relationship between different sources of income and market value of land in peri-urban agriculture indicates that as the market value of land per acre increases in Magadi town and Jenukallu village, the off-farm income per rupee of agriculture and livestock income falls from Rs 4.17 to Rs 1.17, while the proportion of net income from agriculture and livestock to the total income rises.

Though FHUI had greater access to water compared to FLUI, only 30% of the houses had toilets, while in FLUI 60% had toilets. Thus, farmers in FHUI need to be educated on the benefits of following hygienic practices.

The membership in organisations at the village level can be considered as an indicator of collective action. In FHUI, around 50% of the families were members of the Stree Shakti Sangha (sss) and in FLUI, it was 28%. The average savings in

Table 7: Asset Position of Farmers

Assets	FHUI			FLUI			FNUI		
	Investment (Rs)	Running Cost/Year (Rs)	% of Families with	Investment (Rs)	Running Cost/Year (Rs)	% of Families with	Investment (Rs)	Running Cost (Rs)	% of Families with
TV	6,871	1,177	76	6,812	1,277	82	5,200	1,000	19
Mixer	1,476	353	60	2,023	179	68	0	0	0
Grinder	3,500	200	2	3,500	200	2	0	0	0
Cooking gas	4,085	3,035	28	3,268	2,881	48	0	0	0
Biogas	0	0	0	8,000	0	2	0	0	0
Electric stove	0	0	0	750	NA	2	0	0	0
Refrigerator	4,500	600	4	8,300	600	10	0	0	0
Washing machine	0	0	0	6,500	NA	2	0	0	0
Sofa set	10,000	0	2	10,250	0	8	0	0	0
Dining table	5,000	0	2	12,000	0	4	0	0	0
Solar system	40,000	0	2	15,000	0	2	0	0	0
Telephone/mobile	2,505	1,929	52	4,759	2,017	72	2,300	575	19
Bicycle	1,837	412.5	16	1,391	345	22	1,633	238	29
Motorcycle	28,676	10,788	36	43,000	10,553	26	0	0	0
Three-wheeler	0	0	0	46,500	17,500	4	0	0	0
Four-wheeler	0	0	0	167,500	30,000	8	0	0	0
Radio	847	364	22	643	167	30	326	100	57
Music system – DVD	2,827	290	22	2,967	283	18	0	0	0
Personal computer	0	0	0	15,000	600	2	0	0	0
Internet facility	0	0	0	1,500	3,000	2	0	0	0
Any other (truck, etc)	0	0	0	30,000	20,000	2	0	0	0

Table 8: Groundwater Market in Magadi Peri-Urban Agriculture

Groundwater market	FHUI	FLUI	FNUI
Area covered by purchased irrigation water (acre)	1.1	0.375	Not applicable
Annual payment towards water purchase (Rs)	3,785	3,000	Not applicable
Water market price per acre	3,441	8,000	Not applicable

Table 9: Participation in Welfare Organisations

Type of Farmers	Organisation	No of Member Families	% of Member Families	Savings from Inception to 2009 (Rs)	Average Loan Obtained (Rs)	Activities of the Organisation
FHUI	Stree Shakti Sangha	25	50	3,412	9,094	Savings and microfinance
Association farmers	SHG (local)	1	2	2,000	5,000	Savings and microfinance
	Milk dairy	1	2	NIL	NIL	Dairy development
	Cooperative banks	4	8	NA	NIL	Land development and financing
FLUI	Stree Shakti Sangha	14	28	2,742	7,500	Savings and microfinance
Non-association farmers	SHG (local)	8	16	3,520	9,500	Savings and microfinance
	Milk dairy	2	4	NIL	NIL	Dairy development
	Cooperative banks	9	18	NA	NIL	Land development and financing
FNUI remote farmers	Stree Shakti Sangha	12	57	7,619	16,500	Savings and microfinance
	SHG (local)	0	0	0	0	Savings and microfinance
	Milk dairy	0	0	0	0	Dairy development
	Cooperative banks	0	0	0	0	Land development and financing

the sss by FHUI and FLUI families was around Rs 3,000 per family, while they had taken loans of around Rs 9,000. In FNUI, around 60% of the families were members of the sss, but savings were higher at Rs 7,600 per family, which was 100% higher than that of FHUI and FNUI. Accordingly, they were able to get higher loans, amounting to Rs 16,500.

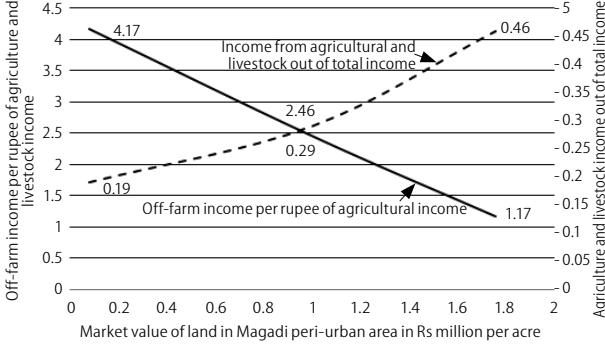
The per capita farm net income of FHUI farmers of Magadi town was Rs 2,194 and of FLUI, Rs 4,402. It was Rs 982 for FNUI (at least 300% lower than Magadi

Table 10: Differential Wage Rate as Indicator of Economic Scarcity of Labour (Rs per day)

	Man-day	Woman-day	Percentage Change
FHUI	200	100	100
FLUI	150	80	87.5
FNUI	80	50	62.5

town farmers). If secondary per capita income is considered, FHUI and FLUI farmers were better off. FNUI farmers' per capita income from secondary sources was Rs 6,543, while that of FHUI farmers was Rs 3,781 and FLUI farmers was Rs 12,414. The monthly per capita health

Figure 4: Relationship between Income Sources and Market Value of Land in Peri-Urban Agriculture (2009)



expenditure was higher for FHUI farmers (Rs 137) compared to FLUI farmers (Rs 98) and FNUI farmers (Rs 8).

The contribution of urban influence to land market value in Magadi town was estimated using the linear Hedonic pricing model.

Policy Implications: As the market value of land per acre increases in Magadi town, the off-farm income earned for every rupee of net income earned in agriculture and livestock keeps declining, which implies that farmers concentrate on agriculture and livestock much more than they would have done in the absence of an increase. The increase in land value is due to two reasons – the proximity of Magadi to Bangalore city and the access to irrigation facilities. The urban influence on land market value is at least Rs 1.1 million per acre and extends up to Rs 1.82 million per acre. This is a pointer to the force of urbanisation on land values. As the difference between land with intensive agriculture and land with diluted agriculture is at least Rs 0.76 million, the influence of agriculture on land value is also substantial. As the market value of land in peri-urban area increases, the net income from agriculture and livestock to the total net income increases. This clearly indicates that the land value is influenced by an increasing proportion of agriculture and livestock income in the total income.

Having proved that the incomes from agriculture and livestock add substantial value to the land, the role of off-farm income cannot be discounted. While the market value of land is one parameter influencing the farmer’s portfolio management, it works more in the long run than

in the short run. Thus, the emphasis on agriculture and livestock in peri-urban areas contributing to an increase in land value is a long-term proposition, and also a sustainable one.

In peri-urban agriculture, the differences in standard of living are largely attributable to access to irrigation. Access to irrigation and improved irrigation efficiency as well as irrigation extension are the keys to improving the standard of living in peri-urban agriculture.

Access to irrigation in peri-urban farming makes agriculture cost-effective (poor access to irrigation raises wages). The portfolio management abilities of peri-urban farmers are poor and need to be strengthened through extension efforts to enable them to reap the benefits of urban and peri-urban influence. Awareness programmes on hygiene are essential, especially where there is access to water.

Despite off-farm employment playing a greater role in all the three groups, it is unsustainable in that off-farm employment depends on outside forces or market forces, which cannot always be relied on. So lessons have to be learnt by FNUI and FLUI farmers from FHUI farmers. It is necessary to increase agricultural activities by providing irrigation and groundwater in FLUI and FNUI. FLUI farms are gradually relegating agriculture at the cost of sustainability. This has serious implications for peri-urban farming in terms of agricultural and livestock production.

Short-term Implications: In the short run, farmers are realising greater off-farm incomes compared to their net income from agriculture and livestock. For instance, in FHUI, for every rupee of net farm income from agriculture and livestock, farmers earn Rs 117 from off-farm employment, which increases to Rs 2.46 in FLUI and to Rs 4.17 in FNUI (Figure 4).

At present, farmers earn a higher proportion of net income from off-farm employment than from agriculture and livestock, irrespective of their location.

The implication of this phenomenon is that farmers who do not practice intensive agriculture (in FLUI and FNUI) receive higher payoffs from off-farm employment. This is most likely to lead to a reduced emphasis on agriculture and livestock in peri-urban and rural areas. Unless policies to augment agriculture and livestock enterprises in FLUI are developed, there are no compelling factors for farmers on them to intensify agricultural activities.

That off-farm employment is contributing substantially to farm incomes across all three groups is significant. All the types of farms have marginal farmers and they practically belong to the agricultural labour class. The net cropped area (the gross cropped area) in FHUI is 0.29 acre (0.48 acre); in FLUI, it is 1.97 acre (2.12 acre) and in FNUI, 0.85 acre (0.85 acre). By legal definition, agricultural labour receives more than 60% of income from labour, which is true in the case of FLUI and FNUI and to a large extent in FHUI. Thus, the strength of these peri-urban farmers lies in their agricultural labour. FNUI farmers receive a major portion of their off-farm income from agricultural work, while FLUI and FHUI farmers receive a major portion of their off-farm income from non-agricultural work. For these agricultural labour forces to be sustainable, their farm incomes have to be strengthened. This requires policy support in favour of peri-urban agriculture. At present there are no policies, especially to promote peri-urban agriculture and animal husbandry. The following programmes are suggested. (a) Promotion of groundwater irrigation (demand-side) as well as watershed development programmes (supply-side). (b) Collective marketing of high-value, low-volume agriculture produce (such as perishable fruits and vegetables, including flowers) and market linkages for increasing the producer share in the consumer rupee and reducing post-harvest losses. (c) Improved road network to reduce transport costs and improved logistics to reduce travel time and increase access to peri-urban and urban markets. (d) Improved market logistics within peri-urban areas to widen the market access to different classes of consumers.