



Land use changes in the rural–urban fringe: An Israeli case study

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ABSTRACT

The paper analyses the changing pattern of land uses in rural settlements located in the rural–urban fringe and makes a link between the results to socio-economic developments and to changes in the rural policy at the national level. Using historical sequences of land use maps and using geostatistical analysis, we observe changing land use patterns in three *Moshav* type settlements – the most common type of rural settlement in Israel – in three different rural–urban fringes belts along the coastal area. We identify basic trends of specialisation and intensification of agricultural land use as well as expansion of built up structures for residential and commercial purposes. These trends which are rather similar for all three cases, we argue, reflect economic and social changes in rural settlements in general and in the rural–urban fringe in particular. The evolving patterns in the three *Moshavim* in the Israeli rural–urban fringe (RUF) can be understood as adjustment measures at the household level to development and changing policies at the macro level, particularly towards the rural sector. There are two major domains of change. First, a transition from dependence on farming to a more diversified economic base suggesting newly shaped interrelationships with the urban space. Second, a new residential development program which has rejuvenated failing and ageing rural settlements. The outcome is a major process of restructuring which affects the economic, social and environmental spheres, and necessitates sensitivity on the part of institutional decision makers towards the complex and diverse realities of relevant actors on the ground, through which all current and future land use policies are mediated. Moreover, being exposed to uncontrolled and often chaotic adjustment measures over the last three decades, it might be necessary to regulate and preserve some of the *Moshav's* distinct features so it does not to fade into an 'ordinary suburb'.

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Introduction

For a number of decades the rural space in developed market economies has undergone a major process of restructuring. Principles of concentration, specialisation and scale economies have been the driving forces of agricultural change (Robinson, 2004; Woods, 2005). This has been coupled with an acceleration of urban encroachment into the rural space, flows of counter urbanisation, an increase in environmental awareness and protection, and changing government and local authorities' policies. From the point of view of the individual farming household the new economic policies, obliged to viability above all, forced farmers into adjustment strategies including adopting advanced technologies. The outcome of increased productivity and efficiency was increased competition among farmers, thus pushing a large number of farmers out of agricultural activity and leading them to search for new survival

strategies (Ilbery, 1998). Altogether the rural space is exhibiting a diversified landscape with a mixture of demographic and occupational profiles of rural dwellers. It is multi-functional by nature and is characterised by new land uses and employment patterns (Holmes, 2005). Moreover, the goods and services produced in this space support broader local and national goals beyond food security and rural development (McCarthy, 2005).

Within the rural space the 'rural–urban fringe' (RUF), the interface between the urban area and the country side, is the belt where the transformation process is the most dynamic. Although the extent of the RUF is subject to numerous interpretations (Vizzari, 2011) rural communities within the RUF are generally characterised by a high degree of integration into urban systems. They are located relatively close to cities, allowing frequent commuting as well as high commercial interactions between them (Razin, 1996). It is a transition zone where urban and rural uses mix and often clash as a result of various forces that drive farmers, homeowners and institutions. The RUF experiences, among others, the loss of prime agricultural land, increased population mobility, changing location advantages of the fringe rural communities and an increase in employment opportunities, the diversification of the economic

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base, increase in costs of land, changes in desired lifestyle, and changes in the pattern of housing (Heimlich and Anderson, 2001).

Studies of land-use in the RUF have revealed a mixture of uses which reflects both the irregular growth and encroachment of the city into the rural space at different directions and different rates, and the difficulties faced by the rural space and its inhabitants to face up to this bow wave. The common resulting pattern is an incoherent land use pattern including agricultural and non-agricultural activities, open spaces and out-of-town retail and service centres, farms and built-up suburbia all of which contest the same space. The outcome is that the dominance of productive usage is giving way to a mixture of production and consumption-led activities, and the rural space surrounding the urban space is losing its traditional image as a farming area (Hart, 1991; Bryant, 2002; Clouser, 2005).

The present paper focuses mainly on a major distinctive feature of rural spaces in general: the pattern of land uses. We observe changing land use patterns in the RUF by focusing on the *Moshav* type settlement – the most common type of rural settlement in Israel – since the 1950s. By doing so, we add a new perspective to the body of knowledge about rural change in the RUF in general and in the Israeli cooperative settlements in particular.

The restructuring of the Israeli rural space

Originally, planned rural settlements in Israel were based, among others principles, on a high degree of cooperation, and were defined as a cooperative organisation. In the case of the *Moshav*, aside from a few exceptions, agriculture was the basis of economic activity. This comprised mainly mixed farming to produce staple foods for the nutrition of the population (Weitz and Rokach, 1968; Schwartz, 1999). Due to their importance for the consolidation of the young state, the planned rural settlements enjoyed institutional support from the national authorities. Under those conditions agricultural production as well as income in the settlements grew constantly for about three decades. Economic development also led to a changing spirit of Israeli agriculture towards more intensive, specialised and export oriented patterns of production. The turning point in the history of the cooperative settlements is linked to a major financial crisis during the 1980s. As a consequence, institutional protection of agriculture and farmers was gradually removed, exposing farming settlements and households to ever more competition and pressure to adopt adjustment measures (Schwartz, 1999; Sofer and Applebaum, 2006).

As a consequence, since the mid 1980s the rural space in Israel has undergone a process of restructuring. The embedded changes are attributed to long-term trends and processes common to many developed economies, such as a tremendous increase in productivity, decline of agricultural employment, and suburbanisation of the countryside. These processes began later in Israel, but have been fast, occurring in a relatively short period of time, and engulfing all types of settlement during the last three decades (Kimhi, 2004). Although the population in rural settlements has increased over time, there has been a remarkable decline in the share of rural population employed in agriculture – about 10% in 2010, compared with 84% in 1960 and 34% in 1980. The majority of the economically active rural population is employed in non-agricultural activities, primarily in the tertiary sector (Ministry of Agriculture, 2011). Of the total economically active population in Israel, the share of those employed in agriculture was only 2% in 2010. While the decline in the number of active farmers was faster than the limited decline in the total area of land under cultivation, the average cultivated farming land per farmer has increased almost ten fold (Ahituv and Kimhi, 2006). Under the steamroller of change and confined to specific local economic conditions and regulations, the rural space has been losing some of its uniqueness: a decline in the degree of collectivisation and co-operation between farmers and among settlement

systems (Ben-Dror and Sofer, 2010), and increased levels of inter-regional and intra-settlement inequalities (Sofer and Applebaum, 2006, 2012).

By the early 1990s, in parallel to the economic changes, the government initiated an “expansion” program, which allowed the allocation of residential plots inside the farming villages. In addition, the state removed another restriction on farmland by allowing, under specific circumstances, the allocation of land for non-farming uses (Israel Land Authority, 1992). Recommendations, following a special committee, facilitated the use of premises and buildings on the home plot for non-agricultural activities (Ministry of Agriculture, 1994). These changes in policy drew new entrepreneurial interests and developers into the rural settlements looking for land resources (Sofer and Applebaum, 2006, 2009). The new types of land use – residential, non-residential, and infrastructural – that now penetrated the rural landscape at the expense of agriculture caused evolving conflicts between farmers, developers, local and national authorities, and the “green organizations” over the use of rural land resources (Sofer and Gal, 1996; Feitelson, 1999).

The most significant land use changes in the rural space of Israel have been occurring at the rural–urban fringe, where internal conflicts within the rural communities and contested entrepreneurial forces have been operating for at least forty years (Gavish and Sonis, 1979; Amiran, 1996). The major factors are similar to those summarised by Shoshany and Goldshleger (2002). These include population growth, decreased demand for agricultural land and increased demand for land for economic investment primarily for housing, regulations expressed by physical planning policies as formalised by government authorities and municipal agencies, ecological considerations represented mainly by NGOs and the Ministry for Environment Protection, endogenous changes spontaneously operating in the rural settlements caused by the penetration of industrial and commercial activities which often contradict official planning policy, and more recently local and national conservation trends (Maruani and Amit-Cohen, 2010).

The in-migration of population into the RUF in Israel has had a significant impact on the host communities in terms of economic, social, cultural and physical change (Sofer and Applebaum, 2006). By introducing suburban development, the in-migrants have affected the nature of the rural communities. Urbanised residents are now living side by side with farmers and ex-farmers. The location of the RUF within commuting distance of urban centres enables the newcomers to benefit from the improvements in transportation, enabling them to enjoy a rural lifestyle and still continue to work in non-agricultural occupations, mainly white-collar jobs or independent businesses located in nearby urban centres (Cohen and Sofer, 2007).

The outcome of all these changes is a significant restructuring of the rural space expressed in sectoral composition, land use patterns, and the loss of both tangible and ideological affinity to agriculture by a growing part of the rural population. This restructuring process, experienced by the *Moshav* in the RUF and its related penetration of non-agricultural activities into the rural settlement is the background and guiding framework for our analysis of land use changes in three *Moshavim*¹ in the remaining parts of the paper.

The *Moshav*: original features and recent transformation

Basic features of the Moshav

There are nearly 1000 rural communities in Israel, most of which are organised as cooperative settlements of different types. These

¹ The plural form of *Moshav*.

communities are organised within 53 rural municipal authorities (regional councils) consisting of approximately 646,000 inhabitants as of 2010, or 8.4% of the national population (Ministry of Agriculture, 2011). The most common type of settlement is the *Moshav*, a planned smallholders' cooperative settlement. The first such community was established in 1921, and there are now about 410 spread throughout the country.

The average *Moshav* contains between 60 and 100 family holdings. The amount of land allocated to each farm unit differs according to the physical characteristics of the region and its type of agriculture, ranging from 3 to 15 ha, and is equitable within each *Moshav*. As in other cooperative settlements, the *Moshav* is based on several ideological and practical principles (Rokach, 1978; Applebaum and Margulies, 1979; Schwartz, 1999). The original principles of the *Moshav* were:

1. **State-owned land**, leased to *Moshav* members for 49 years for a nominal sum, and designated specifically for agricultural use, with an automatic option for renewal or transfer to heirs. The land cannot be divided, not even among heirs, and may be transferred only as a single complete unit. Holdings include a built-up plot and agricultural plots that are legally inseparable.
2. **The family farm** is the basic unit of production, designed to sustain the operating family solely from self-labour in agriculture. The size and structure of farms are determined by income potential. All units in the same *Moshav* were originally based on a similar farm structure and received the same allocation of public resources. The farm is commonly divided into three types of plots. Plot A contains the house and farm buildings. Plot B is the main farming unit and may be divided into two or more sections. Plot C is often a communally cultivated plot, with the profits equally divided among *Moshav*'s households.
3. **A multipurpose co-operative organisation** was established to handle joint purchasing and marketing, to underwrite individual loans, to provide assistance in times of crisis, and to run municipal affairs. The cooperative association took over the management of all village affairs, including municipal matters. Membership in the cooperative society was a prerequisite for farm ownership.

Since the mid-1980s, the *Moshav* has been undergoing a rapid socio-economic transformation. This has occurred in response to the decline of agricultural income, the reduction of state support for agriculture, the erosion in the ideological basis of rural life and agricultural production, and the growing attraction of rural locations for residential purposes, leisure activities, and location advantages for non-agricultural activities, of which the latter is primarily in the RUF. This transformation is reflected, among others, in employment and land use patterns as well as built-up landscapes (Applebaum, 1990; Schwartz, 1999; Sofer and Applebaum, 2006).

Transformation of the economic base

Notable aspects of the transformation in the *Moshav* are the changes in the farm operations and the emergence of new economic activities within the household. Farming households opted for three major survival strategies designed to increase and diversify their income sources (Kimhi, 1994; Sofer, 2001). A relatively small group of farmers has chosen to increase their scale of operation by shifting towards more capital intensive enterprises, introducing new forms of agricultural niches linked to quality products, or renting more land for large-scale cultivation. On average, more than 85% of the household income is then derived from agricultural production (Sofer, 2005). A second group has opted to leave agriculture altogether and relies largely on wage income and businesses, on or off the farm.

The third group, and the most common one, is made of farmers who inclined to adopt pluriactivity as the major income-augmenting strategy (Kimhi, 1994; Sofer, 2001). This strategy includes on-farm and off-farm economic activities, which are facilitated by the enhanced ability of farm households to reallocate their internal labour resources between the farm and external labour markets (Sofer and Applebaum, 2009). In this group, the number of women involved in operating businesses on the farm is increasing and their contribution to the household income is becoming significantly important (Saada, 2007). The reasons for this choice by degree of importance are the falling income levels, the availability of unutilised farm premises, and the desire to take advantage of personal education and vocational training (Sofer, 2001). Pluriactive households still derive on average, a significant share (more than 40%) of their income from agriculture, but they are slowly shifting towards other income-producing activities (Sofer, 2001).

In recent years on-farm business activity and rental of premises, especially on the home plot, have become a common component of the survival strategy of *Moshav* households, a fast growing phenomenon among active farming as well as non-farming households (Sofer and Applebaum, 2009). The type of business and the scale to which this strategy is adopted appears to depend, among others, upon the economic opportunities available in the vicinity of the *Moshav*. In the northern region, the development of tourist accommodation and leisure facilities is a highly popular venture. By comparison, developing businesses in the tertiary sector and renting out premises is relatively more lucrative and popular in the RUF of metropolitan Tel Aviv (Sofer and Applebaum, 2009). Another possibility to generate non-agricultural income in the *Moshav* is to rent houses. This is especially lucrative in the RUF, where demand for housing in a rural settlement is high. Thus, the recent influx of newcomers to the *Moshavim* has to be understood within the general process of suburbanisation (Frenkel and Ashkenazi, 2008).

Since the 1980s therefore, the *Moshav* has become ever more heterogeneous in terms of its social, demographic and economic structure. As a result, the interests of the *Moshav* residents have become increasingly differentiated which in turn has caused a rapid diminution of the cooperative association role in municipal as well as economic issues (Sofer and Applebaum, 2006; Ben-Dror and Sofer, 2010). Altogether, there is a major transformation in the economic, social, organisational, physical, and environmental attributes of the *Moshav*, which raises a question as to whether it is developing a new identity.

Aim and methodology

Focussing on the *Moshav* type of settlement, we trace the development outlined above through an analysis of land use changes in three *Moshavim* located at the rural-urban fringe (RUF). The focal point derives from the fact that the most significant land use changes in the rural space of Israel have been occurring in this belt. Moreover, this area has been experiencing internal conflicts within rural communities and entrepreneurial forces have been operating there for a number of decades. This approach is based on the assumption that changes in land use patterns reflect changing macroeconomic conditions, mediated through decisions of respective individual farming households.

The analysis focuses on three *Moshavim* at the fringe of three different urban agglomerations. They are located relatively close to the cities, in regional councils commonly regarded as the rural belt around the urban agglomeration, allowing frequent commuting as well as high degree of integration between them and the urban space (Razin, 1996). All three are located along the coastal plain of Israel (Fig. 1). Megadim is located in the Hof HaKarmel Regional Council south of Haifa, Mishmeret is located in Lev

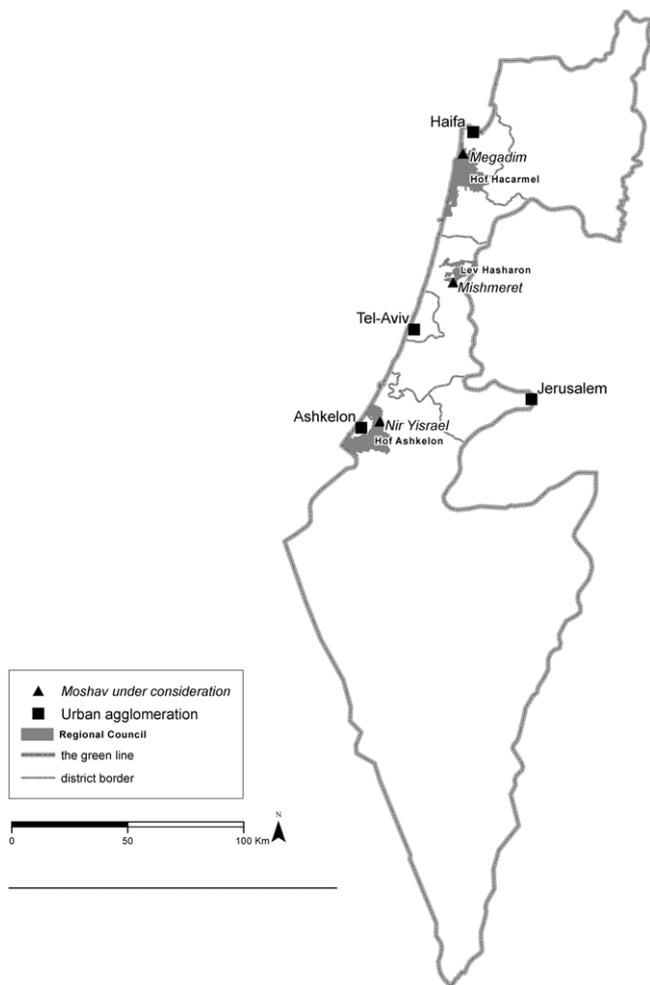


Fig. 1.

Hasharon Regional Council north-east of Tel Aviv, and Nir Yisrael is located in the Hof Ashkelon Regional Council east of Ashkelon. The three *Moshavim* were founded at the same period; Mishmeret was founded in 1946 while Nir Yisrael and Megadim were both founded in 1949. Moreover, the three *Moshavim* have a similar physical design widespread at the time of foundation: the houses are built along both sides of the village roads, and the fields are attached to each house and its farmyard. The term used in Hebrew is 'Kfar Magevet' or 'Towel Village', were the farm units stretched-out and have an elongated shape.

The methodology focussed on a geostatistical analysis of land use patterns. Empirical data were derived from a series of land use maps of the *Moshavim* which were created from historical air photographs as well as a field mapping survey conducted in spring 2009. Thus, it was possible to generate historical sequences of four land use maps for each *Moshav* for the 1950s, 1970s, 1990s and 2009 periods. Additionally, a short questionnaire was distributed among the land owning households of the three *Moshavim* to gather information on the pattern of land use (agricultural land use, renting or leasing of land), income structure (income from farming or non farming activities, generated inside or outside the *Moshav*) and agricultural engagement of the inhabitants. The sample size comprised 27–29% of the land owning households in the respective *Moshavim*. On the basis of the survey it was possible to support the GIS analysis of land use patterns, which in turn provides some complementary information to the land use maps.

The geographic distribution of the settlements analysed in this paper exhibit results which can be significant for *Moshavim* in the

vicinity of urban agglomerations along the coastal plain in Israel. The situation might be different in the northern and southern regions where agriculture is still a dominant activity. The absence of urban agglomerations there probably limits not only the influx of new interest groups into the *Moshav* but likewise the availability of alternative income sources for the rural inhabitants.

Land use changes

Many elements of the restructuring process in the rural space can be confirmed by an interpretation of the changing land use pattern in the *Moshavim*. The quantitative information about land use changes for the period 1956–2009 is visualised in Figs. 3 and 4. Regarding the maps we will focus mainly on the case of Mishmeret (Fig. 2), noting that the general results have been fairly similar in Megadim and Nir Yisrael.²

Looking at the map of Mishmeret in 1956 (Fig. 2a) we can see at a glance that the spatial design strongly resembles the standard model of a *Moshav* established in the late 1940s early 1950s. By principle there are equal parcels of land (about 2.5 ha) parallel to each other. All residential plots are located along the roads of the settlement. Extending out we find the farming premises and subsequently the agricultural fields. The public area is located in the centre of the *Moshav*.

The plots used for residential purposes are relatively small in size (averaged 0.7 *dunam*³) (Fig. 3). The share of arable land was 73% of the total *Moshav* land (Fig. 4) and about 3/4 of it was used as open fields (74%). The rest was cultivated with plantations and there are large areas of unused land to the northeast and southeast of the *Moshav*. The pattern of the family farm is predominantly mixed farming based on a number of small parcels (each one 4.1 *dunam* on average). The relatively small areas allocated for farming premises (1.2 *dunam* on average) indicates the low capital intensity of Israeli agriculture in the early statehood period. Altogether the land use pattern of Mishmeret confirms the high relevance of agricultural production in Israel's rural space in the 1950s.

By 1974 there had been some significant changes in the land use pattern of Mishmeret (Figs. 2b, 3 and 4, Table 1). The residential plots had grown by an average of 0.3 *dunam*, which is interpreted as a response to the rising standard of living. Similarly, farming premises had been extended by 0.5 *dunam* on average indicating an increase in capital intensity of farming, which is also confirmed by the emergence of covered plantations, i.e. greenhouses in the case of Mishmeret. All arable land had been taken for cultivation and unused land had widely disappeared. The number of parcels per farming household decreased and the average size of a cultivated parcel had increased, though only up to 4.5 *dunam* (in Nir Yisrael and Megadim this increase was much higher – up to 7.1 and 8.7 *dunam* respectively). Also, the share of plantations had increased at the expense of open fields which were reduced by about 30%. These trends account for intensification of production where farming is conducted with higher capital intensity and a higher degree of specialisation.

By 1996 additional changes in the land use patterns had taken place (Figs. 2c, 3 and 4). A larger share of the holding was used for residential purposes (up to 1.4 *dunam*); the area allocated to farming premises grew to cover on average 2.7 *dunam* per holding, and the share of cultivated land decreased by 10%. At the same time the overall size of unused areas tripled to 159 *dunams* (Table 1). The average size of a cultivated parcel further extended to 4.8 *dunam*.

² For visualisation of the changes on a graphical scale we refer the reader to kml files in the journal homepage which could be explored with Google-Earth software [<http://dx.doi.org/10.1016/j.landusepol.2012.11.013>].

³ One *dunam* is equal to 1000 M² = one-tenth of a hectare.



Fig. 2.

Table 1
Aggregated area of selected land use types (in dunam) by Moshav and year.

Moshav	Nir Yisrael				Mishmeret				Megadim			
	1958	1974	1997	2009	1956	1974	1996	2009	1956	1978	2000	2009
residential area ^a	92	132	154	236	55	79	108	197	86	120	184	239
residential area ^b	17	21	23	94	0	0	0	52	4	6	41	62
premises	140	176	253	240	79	157	247	232	113	209	228	225
plantation	383	412	550	192	430	996	572	327	71	669	1158	714
open field	1487	1669	1363	1512	1196	844	675	538	2315	1673	786	584
covered cultivation	0	0	4	0	0	56	416	540	0	0	139	495
public area	114	110	104	85	36	39	39	38	37	35	38	49
unused land	245	12	12	167	426	52	159	276	131	13	89	323

^a Households with agricultural plot.

^b Households without agricultural plot.

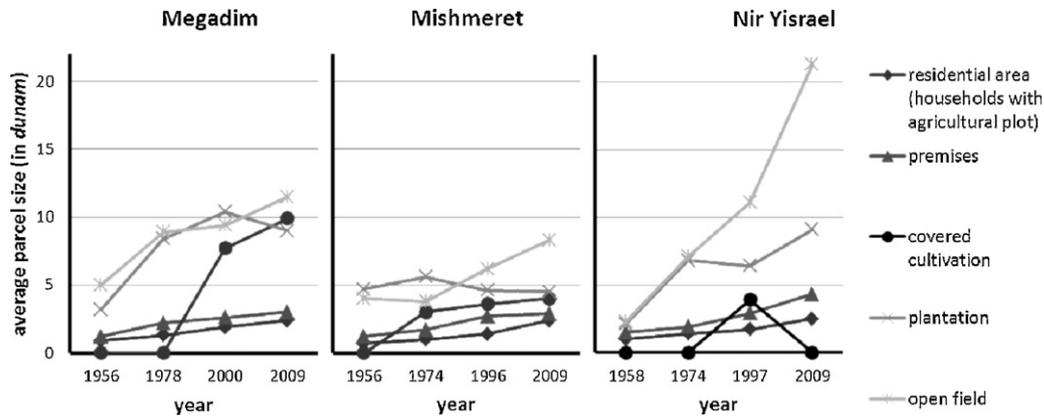


Fig. 3. Average parcel size of selected land use types (in dunam) by *Moshav* and year.

The share of cultivated land used as open fields decreased to about 40%, while plantations and covered plantations became the dominant types of cultivation. At this stage it is impossible to indicate who exactly cultivates the land as subleasing of arable land has become a frequent practice. Altogether, an exit from agriculture seems to have occurred to some degree, while at the same time active farming units went through further specialisation and intensification processes.

By 2009 the expansion program had been implemented in Mishmeret (Figs. 2d, 3, and 4). A new residential area of 90 units was established east of the public land and the total residential area increased significantly together with the associated infrastructure. The area allocated to residential purposes and farm premises on the holdings was further expanded. The trends that were already identified in 1996 have continued and cultivated land further diminished, accounting for only 64% of the total *Moshav* land. The share of covered plantations grew up to 38% of the cultivated area. The focus of production lies on flowers, mostly for the European markets. The number of parcels further declined and the average size of a cultivated plot was extended to 5.2 *dunam*. Unused land grew by another 70% up to 276 *dunam* (Table 1). The processes identified already for 1996 have obviously continued – exit from farming occurred in parallel to further intensification of production.

The case of *Moshav* Mishmeret bears some basic trends in land use development, which occurred in a very similar way in the other two *Moshavim*: Nir Yisrael and Megadim (Figs. 3 and 4 and Table 1). First, there is a clear shift from mixed farming to a higher degree of specialisation and in many holdings there is one dominant crop grown by 2009. This specialisation is closely related to the local physical conditions. In Mishmeret farmers tend to produce flowers, in Megadim, bananas, and in Nir Yisrael, wheat used as fodder

for the local cattle husbandries, is the dominant crop. Secondly, though production is becoming ever more rationalised and capitalised, comparatively more land has been left fallow by 2009 than previously, partly on a seasonal basis. Thirdly, there is a parallel trend between increased intensification and the growth of active farming premises. Another indicator is the shift from open fields to more intensive plantations and the increasing use of greenhouses or shade nets, with the exception of Nir Yisrael, where open fields are still the predominant type of cultivation.

Built up areas have been constantly expanding (Figs. 3 and 4) as the following explains. Firstly, there has been an expansion of residential purpose areas on the family farm. In most cases one or two of the second generation built their home next to their parents' home. Secondly, the expansion of on-farm premises designated for agricultural and non-agricultural purposes. These two tendencies took place on plot A which contains the house and the farm buildings and could be on the expense of a small portion of cultivated land on plot A. However, it is becoming rare to find any commercial cultivation on plot A today (Fig. 2) (see endnote 2). Thirdly, a recent conversion of common and public land into new private housing units has been taking place in the form of the "expansion program" since the early 1990s. This could be on public land or on the communally cultivated plot C, the latter is in most cases on the expense of farming land. The three tendencies occurred to a similar extent in Nir Yisrael and Megadim. While all types of built up structures, residential and non-residential alike, covered between 6% (Mishmeret) and 10% (Nir Yisrael) of the total *Moshav* land in the 1950s, its share increased up to about 20% in all three *Moshavim* by 2009. It should also be mentioned, though not shown in the table and figures, that the area allocated to infrastructure increased significantly since 1956. The expansion of the road system is in line

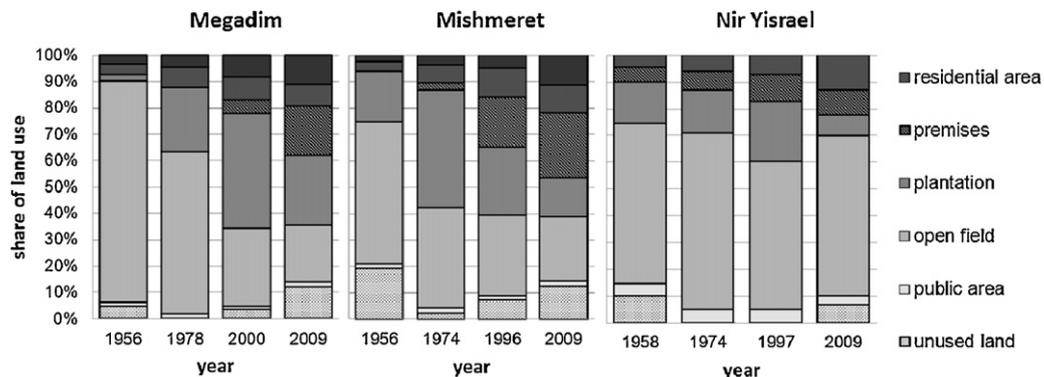


Fig. 4. Percentage share of land uses in each *Moshav* by year.

with the sharp increase in the level of living and thus the level of motorisation.

Discussion

What are the reasons for the tendencies identified above? How can we contextualise and explain the changes of agricultural land uses as well as the continuing expansion of built up areas in the *Moshavim* in the rural–urban fringe? In this section we link the results from the empirical study to wider development patterns and changing rural policies. We argue that the land use changes reflect economic and social changes in rural settlements and in the rural–urban fringe in particular, mediated through individual decisions of households on the ground.

Changes in agricultural land uses

The dominance of open fields and small land parcels in the 1950s is the outcome of a planning policy advocating mixed farming of staple crops for local markets characterised by relatively low capital intensity. Furthermore, the three *Moshavim* were still in their early phase of establishment and the internal differences were relatively small. With time the number of diversified cultivated parcels declined and each parcel increased significantly, as did the premises. Open fields had been replaced by plantations to a great extent and the greenhouses had increased. All these patterns of change reflect a tendency towards a more capitalised, specialised, intensified and market-oriented agricultural regime where crops for domestic and external markets were produced.

The trends in land use patterns resemble the general development in the Israeli rural space – specialisation and intensification – reflecting both the tremendous increase in productivity and the long period of unfavourable terms of trade (Ministry of Agriculture, 2011), as well as growing competition among farmers. Since income from farming is declining per unit of investment, production has become sophisticated and expensive and the rising marginal costs to increase the land under cultivation imposes a growing burden on many farmers, particularly those cultivating small plots of land. These trends are reflected at the settlement level and demonstrated by an increase in the diversification of income sources (Kimhi, 1994; Sofer, 2001). A relatively small group of farmers has chosen to increase their scale of operation by shifting towards more capital intensive enterprises, introducing new forms of agricultural niches linked to quality products, or leasing more land for large-scale cultivation. Others have opted to leave agriculture altogether, but the most common strategy is pluriactivity, including on-farm and off-farm economic activities which are facilitated by the enhanced ability of farm households to reallocate their internal labour resources between the farm and external labour markets (Sofer and Applebaum, 2009).

The results of the household survey allow us to draw some additional insights about farming in the *Moshavim*, confirming the general trends summarised above. Among the original farming households (that excludes households defined as professionals – teachers, doctors, car mechanics etc. who were not allocated farming land, and the new residents of the expansion programs), the share of households deriving at least 10% of their income from agriculture was 62% in Megadim, 52% in Mishmeret and 26% in Nir Yisrael in 2009. In Nir Yisrael active farmers cultivate on average 125 *dunam*, which is about fivefold the original land allocated to them. This land concentration is possible through the sub-leasing and renting of land resources among the *Moshav* inhabitants, which has become a common practise. The survey results show that 46% of the respondents are renting parts of their land to other members of their *Moshav*. The high concentration of farming land in the *Moshavim* is somewhat distorted by the data from Megadim

where the average size of cultivated land accounts for only 21 *dunam*, about the original allocated size of land. A mere 19% of the surveyed farming households in Megadim derive 80% or more of their income from agriculture. By comparison, this share was 33% in Nir Yisrael and 58% in Mishmeret. Consequently, returns from agricultural activities have become a major source of income for a decreasing number of households and there are many part-time farmers with a more diversified income structure. Altogether, only a minority of 14% of the households derive 85% or more of their income from agriculture (most of them in Mishmeret, probably because the regional specialisation on flowers still enables a sufficient income from farming). About 45% have adopted pluriactive income strategies and 41% have no agricultural income at all. This phenomena is typical of the rural–urban fringe where other economic alternatives are available in a relatively close distance. The economic opportunities in the nearby employment centres allow *Moshav* household members either to commute or to use locational advantages to develop on farm non-farming economic activities. The majority of the households (55%) generate a share of their income outside of the *Moshav*, about a third (34%) even more than 50% of their total household income, mostly in the tertiary sector. Unsurprisingly, the commuting destinations are dominated by the proximity to the urban agglomerations. Those are Tel Aviv and Haifa for Mishmeret and Megadim respectively, while the picture is diverse in Nir Yisrael, where people commute to Ashkelon, Tel Aviv and Beer Sheva.

An additional tendency is the rapidly growing amount of fallow land, classified on the maps and in the table as unused land. Between the 1990s and 2009 this phenomenon increased by more than 260% in Megadim, by over 70% in Mishmeret and by twelve fold in Nir Yisrael (Table 1). The land that had been left fallow were for the most part open fields and to a lesser extent plantations. This may support the exit from farming of a significant number of farmers but could be also seasonal particularly in Nir Yisrael, where cereals are a major crop on the open fields. According to the farming households, the decision to leave part of the land fallow is mainly influenced by economic factors such as rising water prices. Moreover, these economic decisions on the micro level might be part of a wider policy for sectoral reallocation of water resources (Feitelson, 1999; Frenkel and Ashkenazi, 2008).

Changes in the built-up area

Three different tendencies contribute to the expansion of built-up areas in the *Moshavim*. First, the continuing expansion of farming premises (including warehouses) is mainly related to the intensification of agriculture. Based on a survey conducted on the ground it was found that some of the premises were used for animal husbandry, such as poultry farms in Mishmeret. Furthermore, we could identify premises of a number of non-agricultural enterprises on some holdings (8 in Megadim, 10 in Nir Yisrael and 4 in Mishmeret). These enterprises are not marked on the maps because the information was partly revealed off record by the inhabitants. Since developing non-agricultural business on officially agricultural land is a tough bureaucratic process, the majority of farm owners circumvent these barriers by establishing enterprises without an official permit (Sofer and Gal, 1996). In the three *Moshavim* under consideration, almost all of these businesses belong to the commerce and services sector such as warehouses, recreation enterprises, a furniture shop, a printing house, an architect's office and even a boarding kennel, all typical of the RUF.

Second, the significant expansion of residential buildings on the holdings is the result of three tendencies. First, the expansion in house size is due to the growth in residents' economic capacity and changing housing preferences. Second, new houses were built on the farmland to provide living space for the second generation and

their families. This is restricted because by law not more than two sons or daughters can build their houses on the parents holding. Third, changing land ownership which entailed purchase by non-farming households, mainly of urban origin, resulted in a different pattern of housing. This is partly a process of rural gentrification experienced by *Moshavim* located in the RUF (Regev-Metuki, 2010).

The third tendency for the expansion of the built up area is the conversion and division of common land into new private housing units occurred in all three *Moshavim* alike; a process which is both a demographic and economic change. Originally, expansion neighbourhoods were created to provide housing space for the second generation in the *Moshav* beyond those who settled on their parents' holdings. However, since many children of farming families left the *Moshav* and moved to the cities for good, houses built in the expansion program were rented out or sold to outsiders who looked for a place to live in a rural environment. Through this influx of new residents (amenity-led migrants) – which is embedded in the greater tendencies of suburbanisation particularly in the RUF – the demographic composition of the *Moshavim* changed rapidly, causing further heterogeneity and conflicting interests within the settlements. From an economic perspective, we can interpret these trends as an invasion of the real estate market to the *Moshavim* in the RUF. Hereby the rural space is becoming ever more an arena of consumption, not only of production.

The interplay of policies and land use patterns

We see a great influence of policies at the national level upon the emergent land use patterns. The widely homogeneous development towards intensification and specialisation of Israeli agriculture was supported by a very protective and financially generous policy towards the agricultural cooperatives. The economic restructuring of the 1980s and the subsequent decline of public support for the agricultural sector exposed farmers to the harsh competition of local and international markets. The growing competition among farmers led to the seemingly contradictory trend towards high concentration and intensification of agricultural land use and simultaneous tendencies towards pluriactivity and farm exits in the *Moshavim* with respective growth of unused land.

Likewise, we can understand the development in the built up area as an outcome of changing policies. The expansion program in the *Moshavim* was a politically induced response to the ageing of the population in the settlements. The decision of many households to generate income from selling or renting the allocated land to outsiders was partly a result of growing debts resulting from the mid 1980s economic crisis. Similarly, the emergence of non-agricultural enterprises on the farms reflects farmers' strategy to explore new income sources under changing economic conditions.

Land use patterns in the *Moshavim* are the aggregated product of decisions made by the farming households. But the available range of options for those households is to a great extent determined by the economic system and respective national policies. Thus, institutional decision makers have to be sensitive towards the realities of the relevant actors on the ground, through which all land use policies are necessarily mediated. Simple restrictions or bureaucratic barriers will not prevent people from exploiting lucrative sources of income – as we can learn from the influx of non-agricultural enterprises into the *Moshav* – if no reasonable alternatives are at hand.

These macro level developments were mirrored by inter-generational changes in cooperative settlements in particular. Nowadays, agriculture is considered by the younger generation to be a business as any other business and no longer an ideological tool of settling the land and making a living. Moreover, with increasing educational levels, farming is not the first choice for most young people in the rural space who are more interested in on farm

non-agricultural activities, using locational advantages which evolved with time and with improved transportation, or in employment in close by urban agglomeration. Altogether, the aggregation of micro level decisions made by the individual *Moshav* household as a response to a changing reality generates new patterns of land uses.

Conclusions

In this paper we analysed changing land use patterns in three Israeli *Moshavim* in the rural–urban fringe (RUF) since the 1950s and embedded the results in general trends of rural transitions. We conclude that land use changes in the *Moshavim* in the Israeli rural–urban fringe (RUF) can be understood as adjustment measures at the household level to development and changing policies at the macro level. This insight bears implications for policies towards the rural economy, ecology and social life. The gradual turn from public support and protection of rural settlements to a withdrawal of subsidies and exposure to international competition caused dynamic and hectic processes of adjustment in the rural communities, and particularly in the RUF. The economic selection process, which influenced many farmers to reduce their agricultural activities or even drop them altogether, as well as the parallel search for new income sources, has led to heterogeneous development in local land use, not all of which was planned and fully regulated. Thus, land use changes in the Israel RUF present, to a certain degree the decline of importance of agriculture to the national and local economy. But they also present the increased choice of rural population for non-agricultural economic activities, as well as the noticeable entrance of a new non-farming population to rural settlements. Land use patterns therefore must always be understood as the outcome of both political and economic frameworks as well as the reactions of local stakeholders.

Based on the analysis of land use changes we can specify two major domains of change. First, it is clear that the transition from dependence on farming to a more diversified economic base has changed the nature of the rural communities. They have been transformed from a space of production to a space of mixed production and consumption. In addition to the supply of agricultural products, the RUF now provides the urban areas with commercial products, leisure services and housing space. The newly shaped interrelationship is also spreading into the labour markets, and the rural communities have become an integral part of the urban employment field, supplying labour inputs to urban areas and local employment opportunities for urban dwellers.

Second, the new residential development, particularly the expansion program, seems to be a move which has rejuvenated failing and ageing rural settlements. Yet the new population is also changing the power structure in the RUF, weakening the position of farmers and their control over the use of land. Another type of pressure on the land comes from contesting interest groups, which include among their ranks both external urban groups and internal groups of farm owners, all of whom wish to re-designate farm land for residential, industrial or commercial uses.

It should be noted that, although this study presumes that the location of *Moshavim* in the vicinity of urban agglomerations is a major factor for the development of new land use patterns, this does not imply that location is the only relevant factor here. The socio-demographic compositions of the population, the degree of commitment of the local population towards cooperative organisation and of course local physical conditions are just a few relevant factors. Additional research is needed to clarify these questions.

Policy makers should bear in mind that the impact of land use policies is dependent on how they are mediated through the realities of rural households on the ground. Those realities are to a great extent determined by a classical locational factor: the proximity to

urban centres and their labour markets, or accordingly, the distance from the urban core and its dissimilar influence on the development of non-agricultural activities. Hence, policy-strategies should be executed according to the differences in geographic and related economic conditions.

Besides these economic considerations, effective land use policy is also an ecological issue. Israel is a small country with a very limited amount of natural assets and their conversion is therefore of great importance. Sustainable management of the limited natural resources can only be achieved in cooperation with local actors and sensitivity towards their economic adjustment strategies to external changes.

Lastly – from a cultural point of view – the future character of the *Moshav* in the RUF is also at stake. This type of settlement played a major role in Israeli settlement history and largely represents the characteristics of the country's rural space. Having been exposed to uncontrolled and often chaotic adjustment measures over the last three decades, it might be necessary to regulate and preserve some of the *Moshav*'s distinct features so it does not fade into an 'ordinary suburb'.

Appendix A. Supplementary data

Supplementary data associated with this article can be found, in the online version, at <http://dx.doi.org/10.1016/j.landusepol.2012.11.013>. These data include Google maps of the most important areas described in this article.

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