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Farmer participation in CAP agri-environment measures for biodiversity conservation in Triglav National Park, Slovenia

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Abstract. Conservation of biodiversity at the field, farm and landscape levels is one of the agroecological principles. In Europe low-intensity farming practices which promote farmland biodiversity are financially supported by different agri-environment measures as part of the rural development policy (under the Common agricultural policy – CAP). We examined farmer participation in agri-environment measures in 8 municipalities within Triglav National Park (TNP) in Slovenia, with a focus on a selection of nine biodiversity promoting measures, which were comparable between the 2007-2013 and 2014-2020 program periods. We detected relatively low interest in any CAP measures with only approximately half of the TNP farmland being registered within the national system. Participation of TNP farmers in nine biodiversity promoting agri-environment measures (AEMs) has shown an overall positive trend between the two CAP programmes, with the most popular measures being organic farming and livestock grazing on high-alpine pastures. However, availability of CAP funds did not stop the farmland abandonment and there were some indications of tourism activities competing with agricultural production. To maintain biodiversity promoting agricultural practices in TNP in the future it will be important to implement agri-environmental measures with sufficiently high payments.

Keywords: agroecology transition, agri-environment measures, biodiversity conservation, protected areas.
JEL codes: Q1, Q5.

HIGHLIGHTS

- Participation in nine comparable agri-environment measures (AEM) increased between the two CAP periods (2007-2013 and 2014-2020) in Triglav National Park but decreased for three AEMs, which demand most labour-intensive and time-consuming agricultural practices.
- The decline in farmer participation in nine biodiversity AEMs in the municipality of Bled indicates competition between agricultural and tourism activities.
- Availability of AEMs did not stop farmland abandonment in Triglav National Park.

1. INTRODUCTION

Food security for the rising human population is threatened by depletion of natural resources, erosion, urbanisation and climate change which prompted a call for a new ecological modernisation of agriculture (Horlings and Marsden, 2011). The principles of agroecology have evolved and today agroecology is associated with a set of environmental, socio-cultural, economic and political principles for management of food systems (Wezel *et al.*, 2014; 2020). Wezel *et al.* (2020) identified 13 consolidated agroecological principles which also include biodiversity, defined as "maintaining and enhancing diversity of species, functional diversity and genetic resources and thereby maintain overall agroecosystem biodiversity in time and space at field, farm and landscape levels".

Agriculture affects biodiversity at two different levels: at the local level due to differences in management practices in each individual field (ploughing, irrigation, use of agrochemicals), and at the regional level due to variability in cover of semi-natural or natural habitats at the landscape scale (Gonthier *et al.*, 2014; Tscharntke *et al.*, 2005). In their review article, Gonthier and colleagues found that less intensive agriculture at the local level increased the species diversity of plants with limited mobility. The species diversity of well-mobile vertebrates was positively influenced by the diversity of agricultural use at the regional level with a higher proportion of areas of natural and semi-natural habitats. Species diversity of invertebrates depended on management at both levels (Gonthier *et al.*, 2014). Similarly, Billeter and colleagues (2007) found that different groups of organisms responded differently to changes in agricultural landscape management, and the species diversity of all groups was higher in landscapes with a higher proportion of natural and semi-natural habitats.

Our society is facing a dilemma between providing enough food for the population (which requires agricultural intensification) and preserving nature and biodiversity and thus agriculture extensification. To promote low-intensity farming practices in Europe which support biodiversity in agricultural landscapes, European Common Agricultural Policy (CAP) measures provide compensation for farmers for the reduction in yields. These measures were implemented as agri-environment measures (in CAP 2007-2013) and as agri-environment-climate measures (in CAP 2014-2020). In their assessment of agroecological transition support by CAP 2014-2020, Linares Quero *et al.*, (2022) state that agri-environment measures (AEMs) and particularly organic farming were recognised as positive by stakeholders in 13 European countries out of 15 included in the study.

In Slovenia, the biodiversity conservation in agricultural landscapes is facing two opposite challenges with agriculture intensification in fertile lowlands and agriculture abandonment in areas facing natural or socio-economic constraints (Kaligarič and Ivajnšič, 2014; Žiberna and Konečnik Kotnik, 2020). The natural geographical conditions in the protected area of Triglav National Park in Slovenia are not ideal for agriculture, especially due to the rugged terrain and climatic conditions. Agriculture has adapted to the given conditions by focusing mostly on animal husbandry and low-intensity use of agricultural land, which are in line with the biodiversity conservation aims of this protected area. However, in recent decades the large landscape diversity of this area, comprising forests, high Alpine peaks and low-intensity agricultural ecosystems is mostly threatened by abandonment of mowing and grazing practices, leading to overgrowth of grasslands and transition into scrub and forest (Triglavski narodni park, 2016). The overgrowth of grasslands leads to loss of open habitat associated species resulting in overall biodiversity loss in a wider area. Therefore, measures are needed to preserve traditional agricultural practices in the Triglav National Park.

As part of the latter, several AEMs were available to farmers within the Triglav national park to encourage biodiversity friendly farming practices. We selected nine of these measures, which showed a continuation and comparability between the CAP 2007-2013 and CAP 2014-2020 programme periods. The aim of our study was to analyse participation of Triglav national park farmers in the nine selected agro-environmental measures that promote biodiversity and are comparable between the two CAP programming periods (CAP 2007-2013 and CAP 2014-2020).

2. MATERIALS AND METHODS

2.1. Study area

Triglav National Park (TNP) is located in the North-West Slovenia comprising Julian Alps with surrounding valleys, covering an area of 83,982 ha. It is named after Triglav, the highest mountain of Slovenia (2864 m above sea level). Land cover is predominantly forest (64%), followed by high altitude shrubland and rocky bare mountains (24%). There are 33 settlements with a total of 2420 inhabitants living in the area according to 2014 census. TNP is designated as a national park (IUCN category II) on the national level and as Natura 2000 and Biosphere reserve on the international level.

2.2. Common Agricultural Policy: agri-environmental measures

Slovenia adopted the CAP in 2004 following its integration into the European Union and the CAP 2007-2013 programme was the first to be implemented for the entire programme period. The CAP 2007-2013 introduced 25 agri-environment measures. In the next programme period (CAP 2014-2020) some of these measures were discontinued and some new ones were introduced with a total of 19 agri-environment-climate measures available to farmers. Furthermore, organic farming, which was previously included among agri-environment measures, was designated as an independent measure in CAP 2014-2020. Between those two programmes periods only 12 measures (including organic farming) were comparable and only nine of these were available to farmers within TNP. To estimate the trend of TNP farmer participation in agri-environmental measures, we selected years 2011 and 2017 as the representative years for the CAP 2007-2013 and CAP 2014-2020 programmes respectively. We focused our analysis on the following nine agri-environmental measures which were all designed as biodiversity conservation measures (promoting agriculture extensification) and their goals did not change between the two CAP periods:

- Organic farming
- Grazing on high-alpine pastures
- Breeding of indigenous and traditional breeds of farm animals
- Mowing of steep grasslands, exceeding 50% slope
- Preservation of special grassland habitats
- Preservation of tall tree meadow orchards
- Hand mowing of hummocky meadows
- Cultivation of indigenous and traditional varieties of agricultural plants
- Animal husbandry in areas of coexistence with large carnivores.

In our study, the data for farmer participation in AEMs was available at the level of municipalities, so eight municipalities (NUTS5 level) that are located in the TNP were included: Bled, Bohinj, Bovec, Gorje, Jesenice, Kobarid, Kranjska Gora and Tolmin. The territory of some of the municipalities extends beyond the border of TNP and the total area of all 8 municipalities was 179,800 ha.

Data on farmer participation in AEMs was obtained from the database of collective applications at the Agency of the Republic of Slovenia for Agricultural Markets and Rural Development (ARSKTRP). Collective applications contained limited spatial information of the farms (municipality), the area involved in individual CAP measures and the total amount of payments to farmers for specific CAP measures. Information about the area of agricultural land in individual municipalities was obtained from the national census statistics (Structural census of agriculture, SI-STAT database). We compiled the information on farmer participation in selected AEMs in eight TNP municipalities in two CAP periods using Microsoft Excel.

2.3. Assumptions and limitations

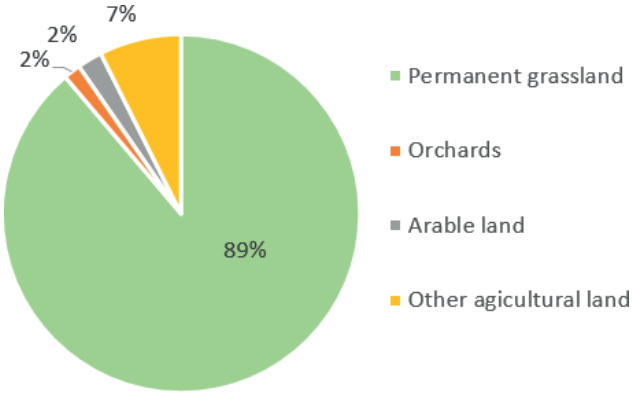
The implementation of AEMs in Slovenia is horizontal, where some agricultural areas may be eligible for more than one measure. Each measure is monitored by area involved in it (in hectares), which may result in double counting of some agricultural plots (gross area). Therefore, the information on the area (in hectares) involved in AEMs is cumulative. We do not have comparable data that count the area once (net area), and that is the main limitation of this research.

3. RESULTS

The results show that only 10% of the TNP area is under agricultural land use out of which 89% are permanent grasslands and only 2% are arable land (Figure 1). We detected a negative trend in agricultural land cover which had reduced from 8,972 ha in 2011 to 8,210 ha in 2017, with an average of 120 ha of agricultural land being abandoned every year. Only approximately half of the farmland area within TNP has been registered in the national register of agricultural holdings, in which agricultural plots are enrolled voluntarily by the farmers enabling them participation in the CAP measures. In 2011 a total of 3,770 ha (42%) were registered, which increased to 4,023 ha (49%) of farmland registered in 2017.

All subsequent analysis were conducted on the level of 8 TNP municipalities, also considering the agricultural land outside the official borders of the TNP with a total agricultural land cover of 11,769 ha. Considering all available AEMs, we observed an 11% decrease in the area of agricultural land enlisted in AEMs between the two CAP periods which surpassed the agricultural land abandonment in TNP (Table 1). The largest decline was detected in the municipalities of Bled (by 75%; from 719 ha to 181 ha) and Gorje (by 73%; from 566 ha to 154 ha; Table 1). The largest increase was observed in the municipalities of Bovec (by 74%; from 414 ha to 721 ha), Jesenice and Kranjska Gora (both by 18%; Table 1). A closer inspection revealed that this decrease can be attributed mostly to the measure of Sustainable animal breed-

Figure 1 Agricultural land use in the Triglav National Park.



ing (CAP 2007-2013) that was no longer available in the CAP 2014-2020.

We further concentrated our analysis on nine AEMs, which were comparable between the two programming periods (Table 2). In CAP 2007-2013 the percentage of the farmland enlisted in AEMs ranged between 10% (municipality Gorje) and 49% (municipality Bovec), with an average of 29% (3,376 ha; Table 2). In CAP 2014-2020 the enlisted farmland ranged between 15% (municipality Bled) and 84% (municipality Bovec) with an average of 48% (5,595 ha; Table 2).

Focusing on nine comparable AEMs, the participation of farmers in AEMs shows an overall positive trend between the CAP 2007-2013 and CAP 2014-2020, with a 66% average increase in agricultural area enlisted in these measures. The largest increase was observed in the municipalities of Kranjska Gora (143%) and Bovec (238%). The exception to this trend was municipality of Bled where a 53% decrease of the area enlisted in AEMs was detected (Table 2).

As for individual measures (Figure 2, Table 2), participation of farmers increased between 2011 and 2017 in 6 AEMs (these were organic farming; livestock grazing on high-alpine pastures; preservation of special grassland habitats; preservation of tall tree meadow orchards; cultivation of indigenous and traditional varieties of plants, and breeding of indigenous and traditional breeds of animals) and decreased in 3 measures (mowing of steep grasslands (exceeding 50% slope); mowing

Table 1. Agricultural land in eight TNP municipalities, enrolled in all available AEMs and in selected nine biodiversity promoting AEMs in two CAP programming periods.

TNP municipalities	Census data: agricul. Land (ha)	Agricultural area under AEMs in ha [participation in %]		
		All AEMs CAP 2007-2013	All AEMs CAP 2014-2020	Change (in ha) [%]
Bled	961	719 ha [*75%*]	181 ha [*19%*]	-537 [*-75%*]
Bohinj	1,718	1,496 ha [*87%*]	1,015 ha [*59%*]	-481 [*-32%*]
Bovec	784	414 ha [*53%*]	721 ha [*92%*]	308 [*+74%*]
Gorje	757	566 ha [*75%*]	154 ha [*20%*]	-412 [*-73%*]
Jesenice	597	470 ha [*79%*]	556 ha [*93%*]	86 [*+18%*]
Kobarid	1,740	1,286 ha [*74%*]	1,469 ha [*84%*]	183 [*+14%*]
Kranjska Gora	1,213	548 ha [*45%*]	646 ha [*53%*]	98 [*+18%*]
Tolmin	3,999	1,671 ha [*42%*]	1,661 ha [*42%*]	-10 [*-1%*]
TOTAL	11,769	7,170 ha [*61%*]	6,405 ha [*54%*]	-765 [*-11%*]
		9 selected AEMs CAP 2007-2013	9 selected AEMs CAP 2014-2020	Change (in ha) [%]
Bled	961	312 ha [*32%*]	145 ha [*15%*]	-167 [*-53%*]
Bohinj	1,718	786 ha [*46%*]	943 ha [*55%*]	157 [*+20%*]
Bovec	784	194 ha [*25%*]	655 ha [*84%*]	461 [*+238%*]
Gorje	757	76 ha [*10%*]	138 ha [*18%*]	62 [*+82%*]
Jesenice	597	244 ha [*41%*]	479 ha [*80%*]	235 [*+96%*]
Kobarid	1,740	856 ha [*49%*]	1,352 ha [*78%*]	496 [*+58%*]
Kranjska Gora	1,213	203 ha [*17%*]	492 ha [*41%*]	290 [*+143%*]
Tolmin	3,999	705 ha [*18%*]	1,391 ha [*35%*]	686 [*+97%*]
TOTAL	11,769	3,376 ha [*29%*]	5,595 ha [*48%*]	2,220 [*+66%*]

Source: Authors' calculation from compiled data of the Agency of the Republic of Slovenia for Agricultural Markets and Rural Development and from national census statistics.

Table 2 Agricultural land enrolled in selected nine biodiversity promoting AEMs in two CAP programming periods. Cumulative area (ha) in eight TNP municipalities is given.

	Agricultural area under AEMs, ha [participation, %]		
	CAP 2007-2013	CAP 2014-2020	Change (in ha) [participation, %]
Organic farming	1,678	2.590	912 [*+54%*]
Livestock grazing on high-alpine pastures	1,577	2.492	915 [*+58%*]
Mowing of steep grasslands (>50% slope)	62	31	-31 [*-50%*]
Preservation of special grassland habitats	5	411	406 [*+8120%*]
Preservation of tall tree meadow orchards	11	39	28 [*+255%*]
Mowing of hummocky meadows	22	9	-13 [*-59%*]
Cultivation of indigenous and traditional varieties of plant	1	11	10 [*1000%*]
Breeding of indigenous and traditional breeds of animals*	254	621	367 [*+144%*]
Livestock breeding in areas of large carnivore presence	20	12	-8 [*-40%*]
TOTAL	3,376	5,595	2,219 [*+66%*]

Note: * In LSU – Livestock unit (not measured in hectares).
Source: Authors' calculation from compiled data of the Agency of the Republic of Slovenia for Agricultural Markets and Rural Development and from national census statistics.

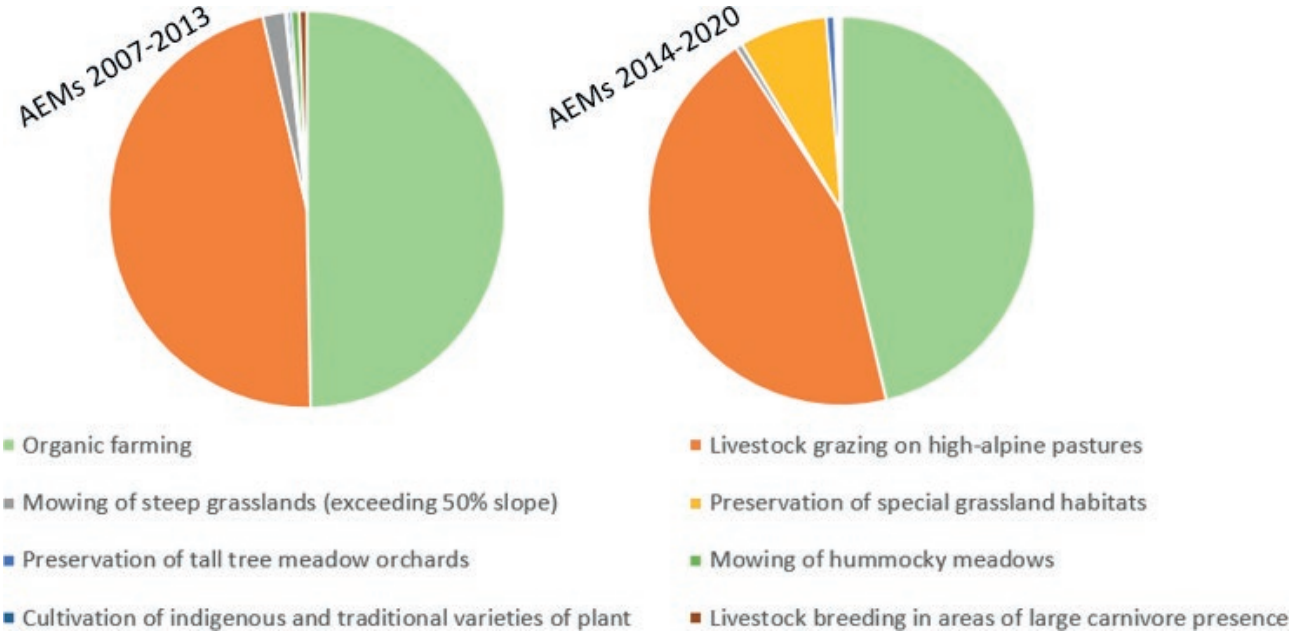
of hummocky meadows; livestock breeding in areas of large carnivore presence). These three measures had a relatively low participation already in CAP 2007-2013. The most popular measures in both programme periods were organic farming and livestock grazing on high-alpine meadows (Figure 2). In the CAP program period 2014-2020, the measure "preservation of special grassland habitats" also gained more attention, with the area involved in this measure increasing from 5 ha to 411 ha. There are two likely reasons for this increase: first the eligible area of ecologically important special grassland habitats was redefined and enlarged; the second was change in restrictions allowing earlier mowing date.

Organic farming is a system that bans the use of synthetic fertilizers and pesticides. It has generally shown positive effects on biodiversity and can be adopted in different agricultural production systems. In 2011, organic farming was implemented on 1,678 ha within TNP municipalities, and in the CAP 2014-2020, the implementation of this measure increased considerably by 54% to 2,590 ha (Table 2). A similar increase in the organic farming participation was also noticeable at the level of entire Slovenia. If we compare the area of TNP municipalities with Slovenia, we note that approximately 5.7% (CAP 2007-2013: 5.6%; CAP 2014-2020: 5.8%) of all organic farming was implemented in TNP municipalities. Organic farming was implemented by farmers from all eight municipalities of TNP.

Livestock grazing on high-alpine pastures was aimed at preservation of traditional transhumance practice based on summer livestock grazing of meadows at higher altitudes and prevention of their overgrowth. This measure was the second most frequently implemented in CAP 2007-2013 (on 1,577 ha of TNP municipalities). A significant almost 60% increase was recorded in CAP 2014-2020, when implementation was extended to 2,492 ha (Table 2). Increase in the implementation of this measure was also recorded at the level of entire Slovenia. Compared to the national level, implementation of the livestock grazing on high-alpine meadows in TNP municipalities represented 38% (CAP 2007-2013: 34.3%; CAP 2014-2020: 42.5%), which means that more than one third of this measure was implemented by TNP municipalities. This AEM was implemented by farmers from all eight municipalities of the TNP.

Preservation of special grassland habitats was designed to maintain and enhance biodiversity of plants, butterflies and birds and their grassland habitats. This measure was available to farmers in important ecological areas and enforced low stocking rates, limited use of organic fertilisers and late mowing or pasture dates. In TNP municipalities this measure was implemented on five hectares (CAP 2007-2013), with a significant increase in the next program period to 411 ha (Table 2). A considerable increase in the implementation of this measure was also recorded at the level of entire Slovenia, which is mainly the result of changed eligibility conditions, namely earlier mowing dates more adapted to local conditions. In comparison with Slovenia, this measure in the territory of the municipalities of TNP amounted to approximately 3%. In the CAP 2007-2013, this measure was implemented by farmers

Figure 2. Proportion of the area of eight selected AEMs implemented by TNP farmers in two CAP programming periods in all TNP municipalities. The measure "Breeding of indigenous and traditional breeds of animals" was not included as it was measured in livestock units and not in hectares.



from two TNP municipalities (Bled and Gorje), and in the next program period by farmers from all eight TNP municipalities.

Mowing of steep grasslands (exceeding 50% slope) required at least one mowing per season and banned the use of fertilisers and agrochemicals. This measure also did not allow the use of grassland as pasture. In CAP 2007-2013, the farms of TNP implemented this measure on 62 ha, and in the next program period on 31 ha. Thus, the implementation decreased by 50% (Table 2). The decrease of areas in this measure was also recorded at the level of Slovenia indicating that the financial compensation for energy and time-consuming manual mowing of steep grasslands was too low. Compared to Slovenia, farms in TNP municipalities implement approximately 8% of the total measure. In CAP 2007-2013, this measure was implemented in all eight municipalities of TNP, while in CAP 2014-2020 only in five municipalities (Gorje, Jesenice, Kobarid, Kranjska Gora and Tolmin).

Preservation of tall tree meadow orchards was directed at preservation and rejuvenation of this habitat and consequently conservation of associated plant and animal species. This measure was implemented on 11 ha in 2011, and on 39 ha in 2017 (Table 2). A slight increase in implementation of this measure was also recorded at the level of the entire Slovenia. Approximately 2% of this measure in Slovenia was carried out in the territory of the municipalities of TNP. In CAP 2007-2013, this measure was implemented by farmers from six municipalities of TNP (the measure was not implemented in Bohinj and Jesenice), and in CAP 2014-2020 by farms from all eight municipalities.

Mowing of hummocky meadows was limited to a specific alpine habitat characterised by pit and mound microrelief and associated with a very high diversity of plants and animals. This measure requires manual mowing and was implemented on a very small scale of the TNP area (22 ha in 2011 and 9 ha in 2017) and was implemented only in the TNP area and nowhere else in Slovenia. In the CAP 2007-2013, this measure was implemented by farms in the municipalities of Bled, Bohinj, Bovec and Gorje, and in the CAP 2014-2020, only by farms in the municipality of Bohinj.

Livestock breeding in areas of large carnivore presence supports maintenance of pastures in areas of coexistence with wolf and bear. Protection of livestock should be ensured using at least 160cm tall transportable electric fence for protection of the flock during nighttime. Alternatively, support is provided for livestock protection by the presence of a shepherd or of shepherd dogs. This measure was implemented on 20 ha in the TNP municipalities and decreased to 12 ha in the next programme period (Table 2). The decrease in participation of this measure is also recorded at the level of the whole Slovenia (probably due to slightly changed eligibility conditions), whereby a negligible percentage of this

measure (approximately 0.5%) is carried out in the TNP municipalities compared to Slovenia.

Breeding of indigenous and traditional breeds of animals strived to maintain genetic diversity of livestock breeds which are adapted to local conditions. This is the only analysed AEM which was measured in livestock units (LSU) and not in hectares. Farmers in the municipalities of TNP implemented this measure for 254 LSU in the CAP 2007-2013, and for 621 LSU in the CAP 2014-2020 (Table 2). Compared to the implementation of this measure in the entire Slovenia, farms of TNP municipalities implement approximately 10% of the total measure. This measure is implemented in all eight municipalities of the TNP.

Similarly, **cultivation of indigenous and traditional varieties of plants** was directed at maintaining agricultural plant diversity, focusing on varieties adapted to local conditions. This measure was also carried out on a very small scale (in 2011 on 1 ha, and in 2017 on 11 ha; Table 2). Even compared to Slovenia, a negligible percentage of this measure was implemented within TNP municipalities (approximately 0.05%).

4. DISCUSSION AND CONCLUSIONS

Although agriculture within TNP does not represent an important economic sector due to very limiting climatic and topographic conditions, farming nevertheless has a very important role in maintaining social balance, customs, and traditions. From the point of view of nature conservation, agricultural activity maintains a high diversity of habitats and landscape elements, which support higher biodiversity (Kleijn *et al.*, 2011; Tscharntke *et al.*, 2005; 2012). Given that the primary mission of this protected area is preservation of ecosystems and natural processes, diversity of habitat types, animal and plant species, and the quality and diversity of landscapes, continuation of low intensity farming is of crucial importance. Furthermore, protected areas such as TNP could serve as pilot sites for a much-needed shift in agroecological transition to "agroecology territories" as proposed by Wezel *et al.* (2016). In such territories three main domains must be considered for successful transition toward sustainable agriculture and food systems: adaptation of agricultural practices; conservation of biodiversity and natural resources; and development of embedded food systems (Wezel *et al.*, 2016).

In this paper we examined farmer participation in CAP agri-environment measures, however, we did not examine the actual effects of individual agri-environmental measures on biodiversity in TNP. Our assumption was that the CAP agri-environment measures are designed to support low intensity traditional farming practices and to preserve biodiversity. The availability of these measures did not manage to entirely halt the abandonment of farming within TNP with approximately 120 ha lost every year between 2011 and 2017 (from 8,972 to 8,210 ha). The continued abandonment of agricultural land in TNP despite the available CAP funds can be attributed to relatively low interest in CAP measures among the local farmers, implied from the fact that only approximately half of the TNP farmland area was registered in the national register of agricultural holdings, which is a pre-condition for farmer participation in CAP measures. Although we detected a slight increase in the percentage of registered farmland between 2011 and 2017 (+253 ha; from 42% to 49%) this percentage is still relatively low compared to the Slovene average of 70%.

The observed increase in overall farmer participation in nine biodiversity AEMs between the CAP 2007-2013 and CAP 2014-2020 programmes is a very positive signal. Interestingly, this increase was not driven purely by increase in payment amounts. The overall payment for 3,376 ha in 2011 was approximately 0.5 million EUR (149 EUR/ha) and for 5,595 ha in 2017 was 0.7 million (130 EUR/ha), indicating a slight decrease in payment per hectare.

Two of the most widely adopted biodiversity AEMs in TNP were organic farming and livestock grazing on high-alpine pastures, both more than doubling in area between CAP 2007-2013 and CAP 2014-2020. Organic farming is practiced on approximately 11% of farmland in Slovenia of which the predominant land use (79%) is grasslands (Travnikar *et al.*, 2023). Given the unfavourable natural conditions for intensive farming in TNP this transition to organic animal husbandry on low intensity alpine grasslands is unsurprising and required relatively few adaptions of the existing practices. This was also confirmed by other studies (Schmidtner *et al.*, 2012; Bjørkhaug and Blekesaune, 2013; Wollni and Andersson, 2014). Payments for transition to organic farming are higher compared to payments for further maintenance of this system which can partly explain the reduction in payments per hectare between the two CAP periods described in the previous paragraph (the analysis includes both payments for organic farming: transition and maintenance). Many studies show that farmers seek economic benefits in the CAP measures (Erjavec *et al.*, 2015, Uthes *et al.*, 2010), which implies that higher payments result in higher participation. Therefore, to increase participation, the agri-environment payments must be sufficiently attractive for the farmers.

Three biodiversity AEMs, namely mowing of steep grasslands (exceeding 50% slope), mowing of hummocky meadows and livestock breeding in areas of large carnivore presence were poorly implemented and farmer participation declined between 2011 and 2017. This indicates that farmers are less interested in labour-intensive and time-consuming agricultural practices (such as manual mowing of steep or hummocky meadows). Financial compensation plays an important breaking point, as farmers weigh the economic benefits and if the compensation for additional and difficult work is not high enough, they will not participate in AEMs (Juvančič *et al.*, 2012; Šumrada *et al.*, 2022). In addition to insufficient financial compensation, previous studies (Kerbler, 2008; Šumrada *et al.*, 2022) indicate that the demanding administration and strict eligibility conditions of AEMs, with general abandonment of agriculture due to unfavourable structural and socio-economic characteristics, are other possible causes of low participation in some AEMs.

Spatial comparison of farmer participation in AEMs among eight TNP municipalities has shown noticeable spatial variation. A considerable decrease in farmer participation in nine biodiversity AEMs in Bled municipality implies competition between farming and tourist activities, with Bled being one of the top tourist destinations in Slovenia. However, tourism in Bled could have encouraged farming in the neighbouring municipalities by bringing in the consumers of the high-quality local products.

Our quantitative analysis was based solely on available data on farmer participation in AEMs and did not include qualitative information based on questionnaires or interviews with farmers which would give us more insight into socio-economic factors influencing farmer participation in AEMs.

Our analysis focused on farmer participation in AECs with a positive impact on biodiversity in TNP. Kaligarič *et al.* (2019) found that agri-environment measures in CAP 2007-2013 aimed at conservation of high nature value (HNV) grasslands in Slovenia were poorly targeted with 41% of grasslands receiving this support not qualifying as HNV grasslands. This implies that a shift from currently used management-based measures, focusing on restrictions of farming practices, to result-based measures, relying on farmer knowledge and rewarding their conservation performance (Šumrada *et al.*, 2022; Burton and Schwarz, 2013) should be promoted, which would have a stronger impact on the agroecological transition.

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AUTHOR CONTRIBUTIONS

I.B.: Conceptualization, Methodology, Writing – Original, Review and Editing, Funding acquisition. T.T.: Conceptualization, Formal analysis, Writing – Original, Review and Editing.

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