

## **Provision of Public Goods Through Mountain Meadows and Pastures in Aosta Valley (Italy)**

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**Abstract:** The traditional exploitation of meadows and pastures in Aosta Valley ensures the provision of high value public goods, including biodiversity conservation, soil functionality, preservation of landscapes, for the whole local community and tourists. In Aosta Valley, meadows and pastures cover about 54,000 hectares; 42,000 hectares of which are alpine pastures. There are about 300 mountain pastures and about 200 of these are used for the production of Fontina PDO cheese, with about 29,000 cattle and 3,800 sheep and goats moved to alpine pastures in summer for grazing. The opportunity to exploit higher pastures must enable the farmers to meet the need to store hay for winter feed in the valleys so cattle move from valleys to mountain pastures in summer. In many cases, smaller farms in the valleys take their cattle, sheep and goats to other farms that own or rent large mountain pastures. The sustainable management of mountain meadows and pastures relies on a complex network of actors, including local breeders, the mountain pasture owners (also municipalities), milk buyers, Fontina PDO cheese producers, and the regional governments. To ensure the appropriate management of meadows and pastures, farms are mainly supported by the agri-environmental schemes under the Rural Development Programme. The main objectives of these schemes are the protection of the environment, landscape and biodiversity; water quality improvement; and greenhouse gas reduction. It is useful to point out that it is absolutely necessary to maintain the support to farms following those schemes.

**Keywords:** Alpine meadows and pastures; biodiversity conservation, soil functionality, landscape preservation; Aosta Valley

### **Public goods from the meadows and pastures**

#### **The extra productive functions of meadows and pastures**

Aosta Valley is the smallest Italian region, located in the extreme north-west of Italy, with an entirely mountainous region that stretches 3,260 sq km. The meadows and the pastures in the Aosta valley are agri-ecosystems that are distinguished from other crops by their multifunctionality as they combine the production function with a series of extra values, which are similar in many aspects to those of natural ecosystems (Gusmeroli, 2012). Specific ecosystem services correspond to the extra functions, and include environmental functions, such as protection of biodiversity, soil protection, reduction of erosion and slope stabilization, and fire prevention, as well as preserving the landscape and traditional culture. In general, the meadows and pastures ensure the long-term viability, including economic viability, in the most marginal areas (Fig. 1).

The important protective function provided by meadows and mountain pastures consists first of all in the maintenance of soil fertility because the presence of sward prevents leaching and the dispersion of mineral elements in the environment. Similarly, the presence of sward contributes

to the stability of the slopes, as the vegetation muffles the beating action of rain, and thereby reduces runoff and the erosion. The presence of sward is also favourable to the settlement of the snowpack so it greatly reduces the risk of avalanches and, although fire mitigation is important in all open spaces (including arable land), grasslands can play a significant role in fire prevention due to their location in the bioclimatic belt of forests: in particular in softwood forests.

Figure 1: Services provided by natural farms systems with regard to the meadows and pastures

Production function	Production in areas unsuitable for crops Stable production over time Conversion of cellulose into nutrients usable by man
Protective function	Improvement of soil fertility Preservation of biotic communities of the soil Monitoring of discharges of nitrogen and phosphorus Retention and degradation of toxic molecules of pesticide Reducing erosion Detention of the snowpack Prevention and containment of fires Protection of wildlife
Ecological function	Enhancement of ecosystem and specific biodiversity
Historical and cultural function	Constitution of the cultural landscape Maintenance and accessibility of open spaces Maintenance of Alpine identity

Source: Gusmeroli , 2012

With specific regard to the permanent grassland, the preservation of biodiversity is closely linked to the diversity of vegetation and management practices implemented by farmers. At the individual level, management intensity (number of cuttings during the year, manuring) significantly influences fodder production and the richness of species of grassland vegetation. At the regional level, there is a wide variety of fields as a result of different intensities of agricultural practices and diversity of environmental conditions (more or less humid or, conversely, more or less dry). The collective interest in the conservation of alpine pastures not only targets the plant biodiversity but also takes the positive effects in terms of conservation of animal biodiversity into account, with specific reference to the herbivorous and birdlife that inhabits the alpine environment. The conservation of the alpine landscape is also important for maintaining the attractiveness of rural areas as residential places or tourist destinations. The need for a better integration between agriculture and services; in particular commercial operators and tourism, should however be noted. It is particularly desirable for tourism, and more generally for the population, to have a greater awareness that the benefits of a higher quality of life are guaranteed by the agriculture and livestock in the Alpine regions. Finally, it is always desirable to have better coordination between tourism and agricultural reality in order to create a constructive dialogue that would bring benefits to both: on the one hand, the use of an attractive rural environment and on the other, the increased profitability linked to the short supply chains and the enhancement of the Alpine products (Lale Murix, 2008).

### **The role of EU policies**

Public intervention helps to promote the production of public goods primarily through two actions: the definition of the mandatory minimum standards and provision of support or incentives to promote a particular good or service. Farm support and norms or standards influence the management of agricultural resources and cause an orientation towards the provision of public goods. The public services are part of the importance of agriculture for the community and give validity to the CAP and the investment of taxpayer funds by the State: despite the budgetary difficulties that are currently affecting all European counties (ENRD, 2011). Cooper *et al.* (2009) identify the European level as the most appropriate for government intervention to mitigate the impact of agricultural activities on public goods, but especially to strengthen the strategic role of agriculture in the supply and development of these assets. They believe that, in the recent past, the CAP has

effectively contributed to achieving the environmental goals, since it was able to spread a greater environmental awareness among farmers. In particular, it has influenced many decisions made by farmers, including preventing the abandonment of rural areas and encouraging the cultivation of large areas with extensive methods.

The second Pillar of the CAP includes agri-environmental measures that are specifically targeted to encourage farmers to provide environmental goods, but this objective is also pursued by supporting the necessary investments and acting positively on aspects related to training, knowledge system, capacity building, and innovation. Through the application of eco-conditionality, the first Pillar of the CAP provides a variable contribution to the production of public goods in addition to the application of Article 68 of Regulation (EC) no. 73/2009. Many environmental objectives are achieved through government interventions that are designed for other purposes, such as direct payments, Article 68, and some measures of axes 1 and 3 of the rural development programs. This implies a recognition of the strategic importance of all measures which have a direct effect on the structural changes and profitability of the agricultural sector, and that they can positively influence environmental performance of farms. A cycle of this type has been identified in the implementation of rural development policies, which contribute to economic sustainability and therefore to the survival of many farms located in less favoured and marginal areas, where the provision of public goods is closely linked to the presence of agricultural activity.

### **Aims and methods of the study**

This study aims to investigate the effects of the traditional management of meadows and pastures in Aosta Valley Region in terms of preservation of plant and animal biodiversity, and more generally on the provision of public goods and services with environmental characteristics. The impact of policies on local pastoral farm systems are also analysed as well as the needs that could be addressed in the re-scheduled rural development regional policy for the period 2014-2020.

The information contained in the administrative database (Regional Agricultural Information System) of the Regional Government of Aosta Valley has been used to describe the availability of forage areas, the seasonal movement of livestock, and the complex system of relationships that exist between cattle farmers and land-owners (private land-owners and public bodies) in Aosta Valley. Eight interviews were conducted with farmers to gain detailed technical information relating to the management of pastures and animals in livestock as well as the motivations, perceptions, and learning mechanisms that are the basis for the interactions between the different actors. Seven semi-structured interviews were conducted with representatives of farmers and administrators and with representatives of institutions, professionals and consultants who carry out their activities in the agricultural and livestock sector. These expert interviews were used to assess the quality of public intervention in support of the pastoral farm system and the perceived needs for the next period of regional rural development policies.

## The results

### The management of livestock and forage areas in Aosta Valley

Farming of dairy cattle is the basis of the agricultural system and local economy in Aosta Valley, with grassland and pastures amounting to about 8,200 hectares in the valley, approximately 1,560 hectares in *mayen*<sup>88</sup>, and 40,000 hectares in *alpeggi* (Table 1). There are about 1,150 dairy farms, but only 200 have structures in *mayen*, while there are about 370 (organized in over 1,000 sheds) located in the *alpeggi*.

Table 1: Aosta Valley: forage areas and farms of valley floor, mayen and alpeggi (2009-2011)

	<i>Alpeggi</i>	Valley floor	<i>Mayen</i>
Total UAA (ha)	40,142	8,226	1,561
Farms(n°)	370	1,156	203
Sheds (n°)	1,020	-	258

Source: Regional Agricultural Information System of the Regional Government of Aosta Valley

In Aosta Valley, the area covered by meadows and pastures is almost entirely (91%) available to private owners and only 5,800 hectares are owned by public entities. These are essentially mountain pastures owned by municipalities that are made available to farmers, with multi-year leases, on the basis of public auctions. While there are slight differences depending on the altitude at which they are located, almost 80% of the forage areas (nearly 51,500 hectares) are made available to farmers through rental contracts (Table 2).

Table 2: Aosta Valley: tenure of forage areas (2011)

	<i>Alpeggi</i>		<i>Mayen</i>		Valley floor		Total	
	ha	%	ha	%	ha	%	ha	%
UAA forage available to Individuals	43,203	89.0	3,313	97.6	12,002	97.0	58,705	91.0
of which:								
UAA forage property	3,535	7.3	699	20.60	2,968	23.98	7,231	11.2
UAA forage for rent	39,668	81.7	2,614	76.98	9,034	73.00	51,474	79.8
UAA forage propriety of entities	5,335	11.0	82	2.42	373	3.02	5,804	9.0
UAA total forage	48,538	100.0	3,395	100.0	12,376	100.0	64,509	100.0

Source: Regional Agricultural Information System of the Regional Government of Aosta Valley

In Aosta Valley, the traditional system of cattle, sheep and goat farming involves an extensive use of meadows and pastures and the exchange of cattle during the summer months. This system is adopted in order to use most of the alpine pastures during the summer and at the same time, it ensure the cutting of grass of meadows in the valley floor and mayen in order to build hay stocks for the winter<sup>89</sup>. In contrast to the practices in other alpine areas where exploitation of high altitude pasture is usually performed by breeders of livestock owners, in Aosta Valley this is mainly realized through the movement of cattle from one farm to another (the farm located in the valley as a source and that located at higher altitude as the receiver). The rent (or trust) of cattle in summer is described under "Civic uses of the Aosta Valley" and is collected by the Chamber of Commerce of Aosta. Generally the cows, sheep and goats are taken and held as 'rented' for between 90 and 120 days. The relevant contracts are almost always verbal: hence the name 'trusts'. The system to determine the lease price of cattle is traditionally based on the quantity of milk produced by the cow on a fixed day of the year, but this tends to be replaced by new types of agreement. In any case, the production of dairy cows during their grazing period in Alpine pas-

<sup>88</sup> We define *mayen* the set of buildings and surfaces and mowed grazed located in the mid-mountain area, which ensuring the maintenance of livestock for an average period of 50 days.

<sup>89</sup> The rules production of Fontina PDO cheese, the main regional dairy production, provides the exclusive use of forage (grass and hay) produced locally.

tures remains with the breeder and the cost of transport of the animals to and from the Alpine pasture is the responsibility of the owner.

The number of animals that are transferred every summer to mayen and to the mountain pastures amounts to over 29,500 cattle, of which almost 16,000 - or about 54% - are dairy cows, and just over 3,900 sheep and goats. Of those that are moved to the mountain pastures, 14,130 head of cattle, which is slightly less than half, and more than 70% of sheep and goats (Table 3) are transferred to trust farms (or summer rental of livestock).

The altitude, the accessibility of funds, and the extension of the properties determine the organization of livestock breeding in the summer months. Different organizational configurations depend on the quantity and characteristics of the meadows that are available to the individual farmers who give and/or take the cattle on trust. The extreme complexity of the relationships at the base of the exploitation of Alpine pastures makes it difficult to identify the exhaustive categories: a breeder can simultaneously give and take livestock by trusts: depending on whether they are productive or unproductive animals .

Table 3 Aosta Valley: head of cattle that are taken to mayen and alpeggi on the basis of typology and category (2009-2011)

Typology and category	<i>Alpeggi</i>		<i>Mayen</i>		Total heads lead up	Total heads by trust
	Total	by trust	Total	by trust		
Cattle < 1 year - total	3,626	1,538	1,012	311	4,638	1,849
Cattle < 2 years – bull/steer	107	32	30	6	136	38
Cattle < 2 years - heifers	3,600	2,043	922	389	4,522	2,432
Cattle > 2 years- bull/steer	44	13	11	1	55	14
Heifers> 2 years	3,290	1,752	912	370	4,202	2,122
Dairy cows	13,078	6,753	2,880	923	15,958	7,676
Sheep - ewes	969	654	265	78	1,233	732
Sheep - others	448	320	110	39	558	360
Goats - does	1,094	505	462	199	1,556	704
Goats - others	392	181	191	83	584	264

Source: Regional Agricultural Information System of the Regional Government of Aosta Valley

It is important to note that, compared to the past the construction of relationships has gradually lost the territorial dimension due to the large-scale use of trucks for the transportation of livestock. Therefore the dynamics of trust now apply to the whole regional and it is not at all uncommon for the same Alpine pasture to contain herds from farms that are located very far one from other.

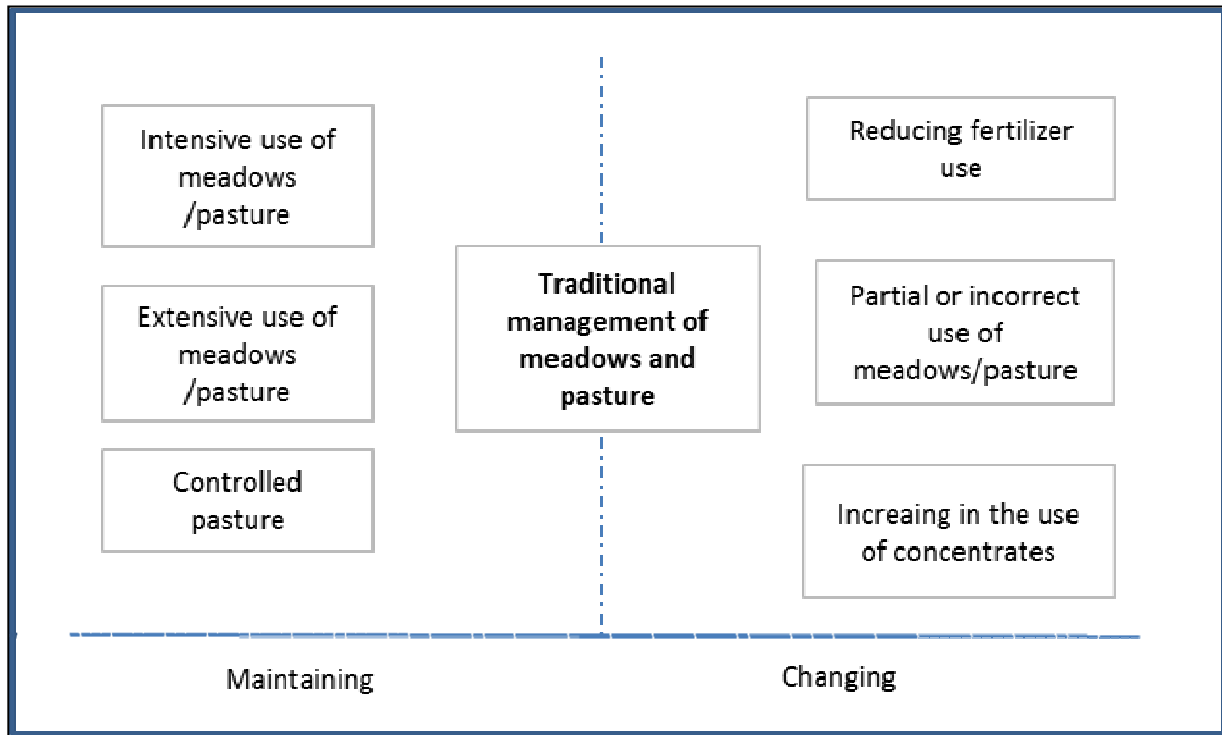
### **The environmental effects of traditional management of alpine meadows and pastures**

The extensive use of meadows and pastures and the traditional farm management described in the previous chapter contribute to the production of a variety of public goods and specific environmental services, which are used by the local population and tourists.

The beneficial effects, in terms of preservation of plant biodiversity, associated with the presence of meadows and pastures and the different ways of utilization of permanent grassland in Aosta Valley have also been documented by specific studies conducted at the local level (Tarello et al., 2004; Bassignana et al., 2009; Bassignana et al., 2011a, 2011b). The different choices in the management of meadows and pastures are reflected in the floristic composition and plant biodiversity, but are often not taken into adequate consideration by farmers. When the bond with the land is sufficiently close, there is more attention given to maintaining the property in good condition and in taking care of the landscape.

The types of permanent grassland in Aosta Valley are quite different, ranging from rather productive and overall less species-rich meadows through to meadows that are less productive but more biologically diverse. The relatively intensively managed meadows, which are mowed fairly early and receive relatively high fertilization, ensure abundant production of hay that is characterized by high nutritional value, while the more extensive meadows also allow farmers to collect good quality hay: even if they make more late cuttings (Curtaz e Talichet, 2011).

Figure 2: Elements that affect the maintenance or change in the traditional technique of management of meadows and pastures



In spite of the limited spatial extent and homogeneous terrain and climate of the Alps, Aosta Valley farming system is characterized by a wide variety of fields, pastures and fallow productive land. The decisions taken by farmers on the management of forage areas have a determining influence on the conservation of forage resources. From the analysis conducted by Bassignana et al. (2011b), surfaces that are grazed, mowed and used for hay cultivation appear to have a higher number of plant species than those whose use is less complex. The summer grazing prevents plant species that are less attractive to livestock from growing and spreading, which benefits the most easily digestible forage, which has favourable conditions for regrowth during the summer season, and also clearly improves the floral diversity of pastures. Wildlife, such as chamois, ibex, and deer, find food in the Alpine pastures in the period immediately following the thaw and in the late autumn. Studies on food competition between cattle and wild grazing animals have demonstrated the advantage that they derive from the land grazed by cattle. Finally, the presence of glades and pastures is essential for the survival of avifauna, which are represented in Aosta Valley by the black grouse and the rock partridge: the latter considered a vulnerable species.

Among the cultivation practices that are essential to the maintenance of Alpine pastures, correct fertilization counteracts the tendency of impoverishment of the soil due to runoff caused by precipitation. In the absence of fertilization, the rich pastures degrade to pastures of average value, dominated by the *Festuca-Agrostis*; then to rough grazing, dominated by *Nardus stricta*; and if it is accompanied by a reduction in grazing pressure (see the phenomena of insufficient livestock density index) and consequent under-utilization of pastures, finally leads to the transformation

into fallow (Bassignana, 2005). The tendency to cultivate only certain areas and promote the spread of uncultivated areas may increase the risk of hydro-geological instability and wildfires, reduce soil fertility, and impact on the attractiveness of the landscape for tourism. On the other hand, proper pasture management promotes the prevention of fires and avalanches and acts favourably on the hydro-geological stability. The increased use of concentrates and non-programming of meadow cuttings have effects on the quality of the grass and, hence, on the quality of milk and cheese.

### **Opportunities from the CAP 2014-2020**

Farmers, administrators, and professionals involved in this investigation have expressed the need to maintain an adequate level of support in order to preserve the traditional system of exploitation of Alpine meadows. Among the measures of EU policy proposals for the programming period 2014-2020 (European Commission, 2011a; European Commission, 2011b), those which best contribute to the maintenance of the traditional system of utilization of meadows and pastures and, therefore, to the provision of environmental goods and services valuable to the community, are highlighted in table 4.

One of the main needs highlighted by the interview respondents is the proper management of forage area to ensure the protection of the landscape, to preserve the environmental aspects, and to maintain or increase tourism. The measures relating to the second Pillar of the CAP, in particular, the agri-environmental-climate payments are among those most suitable for promotion the preservation of the pasture system and, at the same time, for retrieving the more marginal areas. An additional measure to those that have already been applied in the past that is specifically designed to encourage the maintenance of natural spaces, and is therefore potentially capable of countering the spread of uncultivated land, is that which provides the payment of indemnities in favour of those who work in areas that are environmentally sensitive: namely in mountainous areas or in other areas with natural or other specific constraints. An entirely new measure is the ecological payment for greening which is paid in the form of direct payments to farmers in relation to the farm area, and which aims to extend the beneficial practices for the climate and the environment over as wide an areas as is possible.

In order to intervene on business structures (buildings, machines) and on the infrastructure necessary for the development and adaptation of agriculture, which includes access to agricultural and forestry land, re-parcelling, energy supply, and water management, it is necessary to refer to the relevant investment measure that is contemplated by the proposal on rural development. Although own resources (State aid) were mainly used in the past for this kind of intervention, planning interventions that are valid for the programming period 2014-2020 requires assessment of opportunities to draw on the community part-financing. This need arises because of the reduced availability of regional funds as a result of the global economic crisis that did not fail to make its negative effects felt in recent years in Aosta Valley.

The interviews revealed the need to encourage the vertical integration of the livestock industry: even against the promotion of quality products, which is one of the priorities of the European Union with regard to rural development. The measure relating to cooperation appears to be particularly suitable, which for the programming period 2014-2020 is significantly enhanced and extended to a wide range of forms of cooperation (economic, environmental and social) between various types of beneficiaries. This measure aims precisely to encourage the establishment of cooperative relationships between the various operators in the food chain and among others, called for the creation of cluster structures and real networks between various actors. In addition, the intent of the legislator to support European sectorial co-operation should be able to catalyse

economically rational development of short chains, local markets and retailers of food products on a local scale.

Table 4: Needs and opportunities of the CAP 2014-2020

<b>Key factors</b>	<b>Needs</b>	<b>CAP 2014-2020</b>
Accessibility	Adequate fleet; maintain farming in marginal areas	Pillar II - Investments in tangible fixed assets, Benefits in environmentally fragile areas
Management of forage areas	Correct management of forage areas	Pillar I and Pillar II-Greening - Investments in tangible fixed assets; agri-environment-climate payments; Allowances in environmentally fragile areas
Landscape	Correct management of forage areas	Pillar I and Pillar II-Greening - agri-environment-climate payments; Allowances in environmentally fragile areas
Tourism	Correct management of forage areas	Pillar I and Pillar II-Greening - agri-environment-climate payments; Allowances in environmentally fragile areas
Land improvement	Overcome the fragmentation of land	Pillar II - Investments in tangible fixed assets
Administrative burden	Simplification	Among the Pillars
The fragmentation of land	Promote the acquisition of forage area	Pillar II - Investments in tangible fixed assets
Labour force	Find qualified personnel available to work at livestock farms	Pillar II – Knowledge transfer and information actions
Supply chain	Vertical integration	Pillar II - Cooperation
Products quality	To reach and promote	Pillar II - Quality schemes for agricultural products and foodstuffs; Investments in tangible fixed assets
Learning	Vocational training; empowering farmers with regard to correct managerial decisions	Pillar II – Knowledge transfer and information actions

The future rural development programme could also satisfy the further demand for the empowerment of farmers: particularly of young farmers, in their management choices relating to pastures and breeding. The intervention intended to promote the transfer of knowledge and information goes in the same direction and includes not only the organization of vocational training courses, seminars and coaching, but it is also aimed at carrying out demonstration activities and information campaigns. To this end, it highlights the strong emphasis that the EU places on diffusion of innovation (see the role assigned to the existing European partnership for innovation (EPI)) in terms of productivity and sustainability of agriculture, and on the promotion of collective approaches to projects and environmental practices. The EU considers that these measures should produce environmental and climate benefits and be more inclusive and consistent so they can be accessed by individual operators without any connection with each other.

Finally, it underlines the need for simplification, which is one of the objectives of Community policy: so much so that the greening is designed to minimize the administrative burden. The cost of controls and the simplified scheme for small-scale farmers, which provides the payment of a lump sum payment in lieu of direct payments, is also aimed at ensuring administrative simplification and is linked to lightening the obligations of such farmers in terms of greening, cross-compliance, and controls.



## Conclusions

The study highlights the need to conserve the traditional extensive system of utilization of forage in Aosta Valley, which will guarantee the supply of environmental goods and services to the local population and tourists in the future. Proposed agro-technical changes would induce negative effects on the ecological and protective functions of meadows and pastures and on the conservation of the Alpine landscape. However, because of the difficult climate and geomorphology that make agriculture very costly, it is essential to maintain adequate public support for farmers by tapping into the resources that will be made available through the CAP in 2014-2020. A variety of interventions; linked both to Pillar I (greening), and to Pillar II (agri-environment-climate payments, compensation for environmentally fragile areas, etc.) of the future CAP are certainly appropriate to encourage correct exploitation of forage areas and to ensure a positive environmental impact from both a regional and a business perspective.

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