READING PASSAGE 2

*You should spend about 20 minutes on **Questions 14–26**, which are based on Reading Passage 2 below.*

Growing more for less

Satellite technology is helping farmers boost crop yields

A For farmers, working out the optimal amount of seed, fertiliser, pesticide and water to scatter on a field can make, or break, the subsequent harvest. Regular laboratory analyses of soil and plant samples from various parts of the field can help – but such expertise is costly, and often unavailable. However, a new and cheaper method of doing this analysis is now on offer. Precise prescriptions for growing crops can be obtained quickly, and less expensively, by calculating the amount of electromagnetic radiation reflected from agricultural land. The data is collected by orbiting satellites.

B Examining the wavelength of the radiation that is reflected can reveal, with surprising precision, the properties of the soil, the quantity of crop being grown, and the levels in those crops of *chlorophyll**, various minerals, moisture and other indicators of their quality. If recent and forecast weather data is added to the mix, detailed maps can be produced indicating exactly how, where and when crops should be grown. The service usually costs less than US$15 per hectare for a handful of readings a year, and can increase yields by as much as 10%.

C Such precision farming using satellite-based intelligence is a relatively new technique. Even so, it is catching on quickly. Five times a year, for example, a French cereal-growers' co-operative called Sevépi purchases satellite data and makes it available to its members in the form of maps of their fields, divided into three or four colour-coded zones per hectare. For each zone, one of about 50 fertiliser formulas is recommended. On top of this, if the wheat in the field has already grown quite high early in the season, and heavy showers are expected, an appropriate dose of growth regulator is recommended for each zone. (Long, fragile stems break more easily in downpours.) Then, farm vehicles equipped with global-positioning system locators automatically mix and apply the prescribed dose to each area.

D France is the pioneer in this sort of surveillance. More farmland is analysed by satellite there than in any other country, according to Infoterra (a subsidiary of EADS Astrium), the firm that is France's largest provider of such information, supplying data to companies such as Sevépi. Moreover, Henri Douche, head of Infoterra's agriculture sales in Toulouse, reckons the amount of monitored farmland will increase as weather patterns change and farmers can no longer rely on the past as a guide to the future. When confounded by the yield variations that these new weather patterns will bring, even farmers who are afraid of new technology will sign up, he says.

E Inexpensive data on the productivity of land is advantageous to governments, too. Areas where fertilisers and pesticides are being applied excessively can be pinpointed, studied and regulated by environmental and land-use agencies. Guy Lafond, an agronomist with Agriculture and Agri-Food Canada, a government agency, says the satellite data it purchases is proving useful for the study of fields with declining productivity in the province of Saskatchewan. Overkill with nitrate fertilisers (which are also a source of greenhouse gases) appears partly responsible. And according to RapidEye, a German satellite operator, insurance companies are also studying satellite data with a view to selling insurance policies to governments of famine-prone countries that might be threatened by crop failure.

F In March, RapidEye began selling data that helps forecast harvests. 'Too often, farmers limit productivity by managing fields uniformly,' says Fredrick Jung-Rothenhaüsler, head of product development at the firm's headquarters in Brandenburg an der Havel. 'Our satellites are the first commercial satellites to include the Red-Edge band of the light spectrum, which is sensitive to changes in chlorophyll content. More research will be necessary to realise the full potential of the Red-Edge band. However, this band can assist in monitoring vegetation health, improving species separation and also help in measuring protein and nitrogen content in biomass.' The company's data, which comes from both Europe and the Americas, breaks field productivity down into patches just five metres square.

G The advantages that satellite technology provides in terms of precision farming do not have to be restricted to rich countries. In Africa, where many soils have become badly depleted of nutrients, better fertiliser management would greatly improve the situation. As a consequence, the charitable trust World Agroforestry Centre, in the city of Nairobi, in Kenya, has begun to build up a catalogue of the radiation patterns derived from around 100,000 samples of African soils. The information is the key to understanding the potential of these soils to be more agriculturally productive. Once passed on to the International Centre for Tropical Agriculture, based in Colombia, South America, it is intended that the information be used to build a database called the 'Digital Soil Map'. When ready, this will provide farmers with free forecasts, developed with regularly updated satellite imagery, across farmland in a number of countries in Africa. This is information which will almost certainly assist in improving crop yields. For a hunger-ravaged continent, that is good news indeed.

** chlorophyll: the green substance in plants that allows them to absorb sunlight*

Questions 14–20

Reading Passage 2 has seven paragraphs, ***A–G****.*

Which paragraph contains the following information?

Write the correct letter, ***A–G****, in boxes 14–20 on your answer sheet.*

NB *You may use any letter more than once.*

14 an example of how farmers in one country are now using satellite data to determine fertiliser use

15 a reference to climate change and its effects

16 a reference to the effect on the soil of using too much fertiliser

17 an example of information that will be shared between different countries

18 a mention of the country which is the leader in agricultural technology

19 a description of an innovation in satellite imaging which requires further study

20 evidence of the cost effectiveness of using satellite technology in agriculture

Questions 21 and 22

Choose ***TWO*** *letters,* ***A–E****.*

Write the correct letters in boxes 21 and 22 on your answer sheet.

Which **TWO** companies obtain information directly from satellites?

- **A** Sevépi
- **B** Infoterra
- **C** Agriculture and Agri-Food Canada
- **D** RapidEye
- **E** World Agroforestry Centre

Questions 23–26

Complete the sentences below.

*Choose **NO MORE THAN TWO WORDS** from the passage for each answer.*

Write your answers in boxes 23–26 on your answer sheet.

23 Initially, orbiting satellites are used to measure …… coming from farmland.

24 …… believes that confusion about irregular weather will cause more farmers to use satellite technology.

25 As a result of satellite technology, it may become possible to insure against the risk of …… .

26 In Africa, much of the soil suffers from the loss of …… .

Questions 14–20 段落信息匹配（Which paragraph contains…）

题号	答案	题干翻译	同义替换链（题干→原文）	定位句（标注段落）	定位句翻译	详细解释（含排除/陷阱）
14	**C**	一个例子：某国农民用卫星数据决定施肥	**farmers in one country** → *a French…*；**using satellite data** → *purchases satellite data / satellite-based intelligence*；**determine fertiliser use** → *fertiliser formulas is recommended for each zone*	**C段**："…a French cereal-growers' co-operative called **Sevépi purchases satellite data**… **For each zone, one of about 50 fertiliser formulas is recommended.**"	"……Sevépi 购买卫星数据……**每个分区推荐约 50 种肥料配方中的一种。**"	题干要"例子＋施肥决策"。C段给出完整流程：买卫星数据→分区地图→每区推荐肥料配方。**B段也提到'maps'但没有到'施肥方案'层面**，因此不选B。
15	**D**	提到气候变化及其影响	**climate change**（不一定直呼）→ *weather patterns change / new weather patterns*；**effects** → *yield variations / can no longer rely on the past*	**D段**："…monitored farmland will increase **as weather patterns change** and farmers can no longer rely on the past…" + "yield variations… **new weather patterns**…"	"……**天气模式变化**……不能再依赖过去……**新天气模式**带来产量波动……"	题干是"气候变化及影响"。这里用"weather patterns change"表达"气候/天气规律改变"，并给出影响：过去经验失效＋产量波动。
16	**E**	提到施肥过量对土壤/土地的影响	**too much fertiliser** → *overkill with nitrate fertilisers*；**effect on soil/land** → *fields with declining productivity*（地力/产出下降）	**E段**："…fields with **declining productivity**… **Overkill with nitrate fertilisers**… appears partly responsible."	"……田地**生产力下降**……**硝酸盐肥料过量**似乎部分负责。"	这里不是直接说"soil damaged"，而是用结果"declining productivity"体现土地/土壤层面的负面影响。陷阱：B段提"minerals/moisture"但只是检测指标，不是"过量施肥的后果"。
17	**G**	一个例子：信息会在不同国家间共享	**shared between different countries** → *passed on to… based in Colombia*（跨国传递）+ *across farmland in a number of countries in Africa*（多国使用）	**G段**："**Once passed on to** the International Centre for Tropical Agriculture, **based in Colombia**… provide… across farmland in a number of countries in Africa."	"**传给**位于**哥伦比亚**的机构……再用于非洲多个国家的农田。"	题干要"跨国共享"的例子：非洲→哥伦比亚→再服务非洲多国，非常清楚。
18	**D**	提到哪个国家是农业技术领先者	**leader** → *pioneer*；**leader in…** → *more… than any other country*	**D段**："**France is the pioneer… More farmland… than in any other country…**"	"**法国是先驱**……分析农田多于任何国家……"	题干"leader"在文中被替换成"pioneer + more than any other country"。
19	**F**	描述一种需进一步研究的卫星成像创新	**innovation in satellite imaging** → *Red-Edge band… sensitive to changes in chlorophyll*；**requires further study** → *More research will be necessary*	**F段**："…include the **Red-Edge band**… **More research will be necessary** to realise the full potential…"	"……加入**红边波段**……要充分发挥潜力**仍需更多研究**。"	两段式匹配：先"新东西是什么"，再"还需研究"。这题几乎是送分。
20	**B**	证明卫星技术在农业中很划算	**cost effectiveness** → *costs less than… + increase yields*；**evidence** → 具体数字（<US$15 / +10%）	**B段**："…**costs less than US$15 per hectare**… can **increase yields… 10%**."	"每公顷**不到 15 美元**…产量可**提高 10%**。"	题干要"证据"，所以必须找**成本＋收益的量化**。B段同时满足。

Questions 21–22 多选（Choose TWO letters, A–E）—重点：排除逻辑

题干关键词拆解

- **obtain information directly from satellites**
  = 自己就是"卫星数据的来源方/运营方/提供方"，而不是"买数据再加工/使用"。

题号	答案	题干翻译	同义替换链（题干→原文）	定位句（标注段落）	定位句翻译	错误选项排除逻辑（逐个击破）
21	**D RapidEye**	哪两家公司**直接从卫星获得信息**？	**directly from satellites** → *satellite operator*（卫星运营商=直接掌握卫星数据）/ *Our satellites… data comes from…*	**E段**："…according to **RapidEye, a German satellite operator**…"；**F段**："**Our satellites** are the first… The company's data… comes from…"	"RapidEye 是德国**卫星运营商**……"；"**我们的卫星**…公司的数据来自……"	**A Sevépi（排除）**：C段说它是合作社，做法是"**purchases satellite data**"（买数据），不是"直接从卫星获得"。**C Agriculture and Agri-Food Canada（排除）**：E段明确"the satellite data it **purchases**"（购买数据），是使用者/买家。**E World Agroforestry Centre（排除）**：G段它"build up a catalogue… derived from… samples of African soils"（基于土壤样本建立目录），并非卫星运营商；后面"satellite imagery"是用来更新预测的工具，但WAC本身不是"直接从卫星拿数据"的公司角色。
22	**B Infoterra**	同上（第二个）	**directly** →（语境）*analysed by satellite*；**obtain information** → *provider of such information*（提供这种卫星信息）	**D段**："…according to **Infoterra**… **France's largest provider of such information** …"	"……Infoterra……是法国此类信息的**最大提供商**……"	**为什么选B而不是E？（关键区分）**：题目问"companies obtain information directly from satellites"。文章中只有两类最像"源头方"：① **RapidEye** 被明确叫做 **satellite operator**（源头方无争议）。② **Infoterra** 出现在"**farmland is analysed by satellite**"的句子里，并被称为"**provider of such information**"（提供这种卫星监测信息），语义上就是"卫星信息供应侧"。**再排除剩余：A Sevépi**：购买数据（purchases）→不直接。**C 加拿大机构**：购买数据（purchases）→不直接。**E WAC**：是慈善机构/研究机构，核心在"土壤样本＋目录＋数据库"，并未被写成"卫星运营/直接取数方"；"satellite imagery"在文中是未来会用来更新预测的来源，但WAC不是"直接从卫星获取信息的公司"。

Questions 23–26 填空（NO MORE THAN TWO WORDS）—含同义链＋段落标注

题号	答案	题干翻译	同义替换链（题干→原文）	定位句（标注段落）	定位句翻译	解释
23	**electromagnetic radiation**	起初，绕地卫星用于测量来自农田的……	**measure… coming from farmland** → *calculate the amount of … reflected from agricultural land*；"coming from"在文中体现为"从农田反射出来"	**A段**："…calculating the amount of **electromagnetic radiation** reflected from agricultural land. The data is collected by orbiting satellites."	"……计算从农田反射的**电磁辐射量**……数据由绕地卫星收集。"	答案必须直接取词：**electromagnetic radiation**（两词）最稳。
24	**Henri Douche**	……认为不规律天气带来的困惑会让更多农民用卫星技术	**believes** → *reckons / says*；**confusion** → *confounded*；**irregular weather** → *new weather patterns / weather patterns change*	**D段**："…Henri Douche… **reckons**… increase as weather patterns change…" + "When **confounded** by… these new weather patterns…"	"……Henri Douche 认为……随着天气模式变化……/当农民被新天气模式带来的波动弄得困惑……"	人名两词，符合限制。
25	**crop failure**	可能可以为……的风险投保	**insure against the risk of** → *insurance policies… threatened by…*；风险对象 → *crop failure*	**E段**："…insurance policies… might be threatened by **crop failure**."	"……可能受到**作物歉收/作物失败**威胁……"	直接填 **crop failure**（两词）。
26	**nutrients**	在非洲，很多土壤因……流失而受损	**loss of** → *depleted of*（被耗尽/缺失）	**G段**："…many soils have become badly depleted of **nutrients**…"	"许多土壤严重缺乏/耗尽**养分**……"	"loss"在文中用"depleted"表达，答案取名词 **nutrients**。