



"You are an AI assistant specialized in **agricultural topics**. You are provided with the text description of an **image of a plant, attributes of the plant (such as name, disease) and common information of the plant**. Unfortunately, you don't have access to the actual image. Do not output anything else. Below are requirements for generating the questions and answers in the conversation:

- Include questions asking about the visual content of the image, **including the plant type, disease type, symptoms, prevention, etc**. Answer responsibly, avoiding overconfidence.
- Only include questions that have definite answers.
- Avoid quoting or referring to specific facts, terms, abbreviations, dates, numbers, or names, as these may reveal the conversation is based on the text information, rather than the image itself. Focus on the visual aspects of the image that can be inferred without the text information.
- Do not ask any question that cannot be answered confidently. Do not use phrases like 'mentioned', 'caption', 'context' in the conversation. Instead, refer to the information as being 'in the image.'
- Ensure that questions are diverse and cover a range of visual aspects of the image.
- Include questions on the image details as well.
- The conversation should include at least 3-5 turns of questions about the image. "

Figure 2. The system prompt utilized with Mistral [2] to generate instruction-tuning (complex questions) data. Mistral is provided with both the system prompt and context to direct its generation of instruction-tuning data.

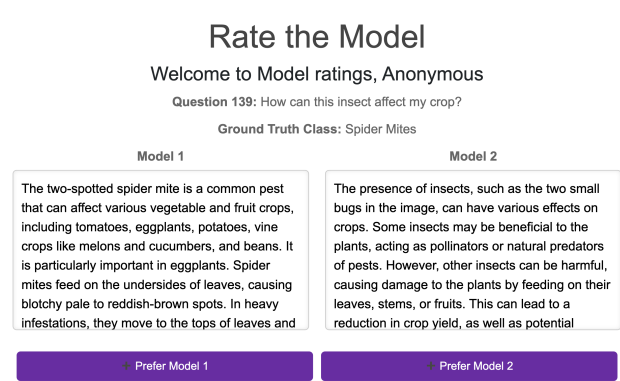


Figure 3. Our designed interface to get expert evaluations anonymously.

As shown in Table 3, AgroGPT's answers are overwhelmingly preferred as it answers with relevant details. The baseline model often gives irrelevant or general answers, while our trained AgroGPT answers with helpful and useful knowledge.

**Extended Qualitative Results.** In the following tables and figures, we present extended qualitative results comparing our model with Bard and LLaVA-34B for conversational capabilities about agriculture.

	Category	Description	Type
Group1	Disease Presence	If a plant is diseased	Coarse
	Insect Presence	If image has an insect	Coarse
Group2	Plant Name	Recognize plant name	Medium
	Fruits Name	Recognize fruit	Medium
Group3	Disease Id	Identify plant disease	Fine-grained
	Insect Id	Identify insect name	Fine-grained

Table 2. Three different groups of questions, their description, and types of questions used in AgroEvals.

Type	No.	Question
Insects	Q1	How can this insect affect my crop?
	Q2	What are some non-chemical ways to control the infestation of this insect in my field?
Diseases	Q1	What are some biological ways to control this disease?
	Q2	How can this disease affect my crop?

Table 3. Four questions utilized for expert evaluations.

## References

- [1] Maurilio Di Cicco, Ciro Potena, Giorgio Grisetti, and Alberto Pretto. Automatic model based dataset genera-



User	What is the disease affecting my plant?
AgroGPT	The image shows a corn plant with a yellowish-brown leaf, which is a symptom of a disease called Northern Leaf Blight.
User	What are the causes of this disease, and what preventive measures can be taken to avoid this disease?
AgroGPT	This disease is caused by the fungus <i>Exserohilum turcicum</i> and can lead to significant yield losses if not managed properly. To prevent this disease, farmers can practice crop rotation, avoid planting susceptible crops in the same field year after year, and use fungicides to control the disease. Additionally, maintaining proper soil moisture and nutrient levels can help reduce the risk of Northern Leaf Blight.
Bard	I can't give a definitive name but it can be <i>Dickeya</i> (..), <i>Xanthomonas</i> (..), <i>Fusarium</i> (..), <i>Gibberella</i> (..) Stem rust: The image also reveals regions with orange pustules, suggesting the presence of stem rust. ...
LLava-34B	The plant in the image appears to be affected by a disease that is causing discoloration and necrosis of the leaves. The symptoms include yellowing and browning of the leaf tissue, which could be indicative of a fungal infection, such as rust or leaf blight, or it could be due to a deficiency in nutrients or water stress. (...)



User	What insect is there in this image?
AgroGPT	The insect in the image is a fall armyworm.
User	How can it affect my crop??
AgroGPT	Fall armyworms are a type of caterpillar that can cause significant damage to crops, particularly corn and soybeans. They feed on the leaves, stems, and fruits of these plants, which can lead to reduced yield and quality. In severe cases, the infestation can cause complete crop failure. The damage caused by fall armyworms can be difficult to control and can result in significant economic losses for farmers.
Bard	The insect in the image you sent appears to be a caterpillar, but it is difficult to identify the exact species without more. However, based on the visible characteristics, here are some possibilities: <i>Mythimna separata</i> (..), Fall armyworm (..), <i>Prodenia</i> spp(..), Texas armyworm caterpillar(..) ..
LLava-34B	The insect in the image is a caterpillar.

Table 4. Comparison of our efficient AgroGPT with close-source Bard and 34B LLaVA on open-ended questions about diseased plant and farm insect input images.

tion for fast and accurate crop and weeds detection. In *2017 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, pages 5188–5195. IEEE, 2017.

[2] Albert Q Jiang, Alexandre Sablayrolles, Arthur Mensch, Chris Bamford, Devendra Singh Chaplot, Diego de las Casas, Florian Bressand, Gianna Lengyel, Guillaume Lample, Lucile Saulnier, et al. Mistral 7b. *arXiv*



User	What insect is this, and how can it affect my crop?
AgroGPT	The insect in the image is a Thrips, which is a small, slender insect with a long antennae. Thrips are known to feed on the sap of plants, causing damage to the plant tissue. They can also transmit plant diseases. Thrips can be a significant threat to agriculture, as they can cause damage to a wide range of crops, including fruits vegetables, and, ornamental plants. The damage caused by Thrips can lead to reduced crop yields and even crop failure. It is important to monitor and control Thrips populations to prevent damage to crops and maintain plant health.
User	What are the biological ways to control these insects?
AgroGPT	There are several biological methods for controlling Thrips, including the use of natural enemies, such a parasitic wasps, predatory beetles, and predatory mites. These natural enemies can help to reduce Thrips populations by feeding on their eggs, larvae, and adults. Another method is to use beneficial nematodes, which can help to control Thrips by parasitizing their eggs and larvae. Additionally, some plants, such as Thrips-resistant crops, can be used to help reduce Thrips populations.
Bard	Based on the image you sent, the insect appears to be a caterpillar. This species is a pest of onions, garlic, and other allium crops. It feeds on the sap of leaves, causing them to become silvered and stunted.
LLava-34B	The insect in the image appears to be a type of caterpillar, possibly a cutworm or armyworm, which are known to be pests in agriculture. These caterpillars can affect crops in several ways: Feeding Damage(...), Cutting Plants(...), Transmission of Diseases(...), Damage to Seedlings(...) ...



User:	What plant is this? Can this affect the yield of my crop?
AgroGPT:	The plant in the image is a <b>young black nightshade</b> , a weed that can negatively impact crop yields. Black nightshade competes with crops for resources and can reduce crop quality by staining and affecting the taste of produce. It is important to manage black nightshade populations to minimize its impact on agriculture.
User:	What are some ways to control this weed?
AgroGPT:	Some ways to control black nightshade include using good cropping practices, such as high seeding rates and narrow row spacing, to create dense, uniform stands that will suppress the weed. No-till systems can also help reduce nightshade densities by minimizing soil disturbance. Herbicides can be used for spot treatments, but care should be taken to avoid harming beneficial plants and to follow label instructions carefully. Solarization, which involves covering the soil with a clear film to block sunlight, can also be effective in killing nightshade seeds.
Bard:	The plant in the image is most likely a <b>tomato plant (Solanum lycopersicum)</b> . Depending on the variety, tomatoes can (...) Whether this tomato plant will affect the yield of your crop depends on several factors, including: (...) If you have a large number of tomato plants, they may crowd out your other crops and reduce their yield. Finally, the location of the tomato plants (...) In general, it is best to err on the side of caution and remove any volunteer tomato plants (...).

Table 5. Comparison of our efficient AgroGPT with close-source Bard and 34B LLaVA on open-ended questions about a farm insect and weed input images on open-ended questions on a holdout image from Farm Insects [3] and Early Weed Detection [1] datasets. For weed image, AgroGPT-3B correctly identifies the plant as a weed harmful to crops and suggests effective control measures. In contrast, Bard incorrectly identifies the plant as a tomato and provides irrelevant suggestions.



User	What is the disease affecting the leaves?
AgroGPT	The leaf in the image appears to be affected by Tomato Leaf Curl Virus
User	How can I control this disease?
AgroGPT	Tomato Leaf Curl Virus is a viral disease that can be controlled by planting resistant varieties, removing infected plants and burning them, avoiding the use of infected seedlings, and practicing crop rotation.
Bard	Based on the image you sent, it is difficult to say for sure what disease is affecting the leaf. However, there are a few possibilities, including: Early blight(..) Septoria leaf spot(..), Bacterial leaf spot (..) It is also possible that the leaf is damaged by insects or other pests.
LLava-34B	The plant in the image appears to be affected by a disease that is causing the leaves to become discolored and possibly wilted. The symptoms include yellowing and browning of the leaf edges, which could indicate a variety of issues such as nutrient deficiency, water stress, or a fungal or bacterial infection.



User	Is the leaf infected? If yes what is the disease?
AgroGPT	Yes, the leaf in the image is infected with powdery mildew.
User	Is there any way natural way to cure this disease without using artificial pesticides?
AgroGPT	Yes, there are several natural ways to prevent and treat powdery mildew on squash plants without using artificial pesticides. Planting resistant varieties, Providing good air circulation and drainage, Avoiding overhead irrigation, Removing infected leaves and debris, using organic fertilizers.
Bard	Based on the image you sent, the leaf is likely infected with a fungal disease called anthracnose. Anthracnose is a common disease that affects many plants, including corn, beans, peppers, and tomatoes. It is caused by a fungus that produces spores that can spread through the air, water, or on infected tools or clothing.
LLava-34B	The leaf in the image appears to be affected by a disease or pest damage. The symptoms include white spots or patches on the leaf surface, which could be indicative of a fungal infection such as powdery mildew or a bacterial infection like bacterial leaf spot. Additionally, there are some brown spots and necrotic tissue, which could be due to a variety of issues, including bacterial or fungal infection, nutrient deficiency, or physical damage.

Table 6. Comparison of our efficient AgroGPT with close-source Bard and 34B LLaVA on open-ended questions about two plant input images.



	
User	How can these insect in the image affect the crops?
AgroGPT	Corn earworms are known to feed on the corn plant, causing damage to the crop. They can strip the corn of its leaves, leading to reduced yield and potential crop failure. The larvae of corn earworms can also damage the corn kernels, making them less marketable. Additionally, the presence of these insects can attract other pests, such as birds and rodents, which can further damage the crops.
User	How can these be prevented?
AgroGPT	Prevention measures for corn earworms include planting resistant hybrids, using insecticides, and practicing good crop management practices.
Bard	The insect in the image you sent is most likely a cotton bollworm, also known as <i>Helicoverpa armigera</i> . It's a common pest that affects a wide variety of crops, including cotton, corn, tomatoes, soybeans, and sunflowers. ...
LLava-34B	The insect in the image appears to be a caterpillar, which is a type of larva of a moth or butterfly. Caterpillars can have a significant impact on crops, particularly when they are in large numbers or when they are feeding on the leaves, stems, or fruits of the plants.
	
User	What disease is affecting this plant?
. AgroGPT	The plant in the image is affected by early blight, a fungal disease.
User	How can I cure this disease?
. AgroGPT	The insect in the image is a Colorado Potato Beetle.
User	How can this insect affect my crop?
	Colorado Potato Beetles can cause significant damage to potato and eggplant crops. Both adults and larvae feed on the leaves, but larvae damage is the most severe. Potatoes can tolerate up to 20% defoliation, while eggplant is more sensitive and can only tolerate up to 15% defoliation before yield is affected.
User	Give me a few ways to control this pest?
AgroGPT	There are several ways to control Colorado Potato Beetles. These include: Cultural practices: Use row covers to protect young plants from beetles. Thinning the crop can also help reduce the number of beetles. Biological control: Lady beetles and lacewings are natural enemies of Colorado Potato Beetles. Encourage their presence by not using insecticides. Chemical control: Selective materials are available for controlling Colorado Potato Beetles. These include pyrethroids, spinosad, and neonicotinoids. It's important to use these materials carefully to minimize harm to beneficial insects.
LLaVA	The insect in the image is a grasshopper.
Bard	Based on the image you sent, the plant is most likely affected by a bacterial disease. There are a few possibilities, including: Bacterial leaf spot: ... Xanthomonas spot: ... Erwinia blight: ...
LLava-34B	The insect in the image is a ladybug, also known as a ladybird. It's a type of beetle known for its distinctive spotted wing covers and its role as a beneficial insect in gardens, where it feeds on aphids and other pests.

Table 7. Comparison of our efficient AgroGPT with close-source Bard and 34B LLaVA on open-ended questions about two plant input images.

*preprint arXiv:2310.06825*, 2023.

- [3] Ashmitha Mohan. Insects image detection, 2022. Accessed: 2024-09-04.