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Farmers' Perceptions of Plantain Production Constraints in Port Harcourt Metropolis, Southern Nigeria

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ABSTRACT: Participatory rural appraisal surveys aimed at determining farmers' perception of plantain production constraints in Port Harcourt metropolis (specifically at Rivers State University [RSU], Nkoplu and the Agricultural Development Programme [ADP] farms, Rumuodomaya) have revealed: poor soil fertility, wind, "drought" and "disease" (in that order of importance) as the major militating factors to plantain (or *Musa*) production in this region. Farmers' misjudgments and confusions were nonetheless, remarkably pronounced in this study; their so-called "drought" category (aka "dryness" or sunlight effects) was apparently all foliar defects arising from fungal, viral and/or bacteria attacks, while "disease" entailed all abnormalities on fruits, pseudostems etc., and sometimes even fallen stands. Also since they were oblivious of the causal factors or agents responsible for pseudostem snapping and toppling (i.e. falls arising from weevil and nematode attacks) respectively, they attributed such occurrences to "breakages" and "wind/breeze" effects. These preliminary surveys have successfully revealed farmers' understandings and perceptions of the major constraints to plantain production in this axis. Appropriate interventions via enlightenment and training campaigns can now be planned to educate these farmers adequately. It is hoped to bring to an end all misconceptions or wrong perceptions, and to also eliminate or significantly reduce/curtail the wreck-less use of chemicals (pesticides, fertilizers etc.) by untrained farmers and the citizenry; and the often attendant pollutions, pest resistance and residue problems etc. prevalent in this region and in the wider society.

Keywords: Farmers' perception, Production constraints, Snapping, Toppling, Participatory rural appraisal

Introduction

Plantains constitute the fourth (4^{th}) most important food crop in the world after rice, wheat and maize; and the third (3^{rd}) most important starchy food in Nigeria (Ayanwale *et al*., 2016). Together with bananas, *Musa spp*. are amongst the major food staples of Africa - producing over 31 million tons annually from small family farms, and constituting approx. one third (⅓) of global productions (Lescot and Ganry, 2010). Vuylsteke *et al*., 1993 had similarly remarked that *Musa* are vital food crops in Sub Saharan Africa providing more than 25% of carbohydrate needs for over 70 million; and huge revenue sources for most smallholders.

Africa is renowned for *Musa* production in the world, and accounts for approx. 62% of world productions (Tenkuoano *et al*., 2019). The area between the lowlands of Guinea and Liberia in West Africa and the coastal basin of the Democratic Republic of Congo [DRC] in Central Africa produces half (50%) of the total world output of plantains (Swennen, 1990; Ferris, 1998); while the East African highland region records the highest consumption figures in the world (Ferris, 1998).

Plantains form the third most important food-crop in many African countries, for example, in Nigeria (Akinyemi *et al*., 2010), Ghana (Chamberlin, 2007), DRC (Adheka *et al*., 2018), and Cote d'Ivoire (Tenkuoano *et al*, 2019). In West Africa, the major producers are Cameroon (4.5 MT), Ghana (4 MT), Nigeria (3.2 MT), Cote d'Ivoire (1.6 MT) (Adheka *et al*., 2018); while the highest per capita consumptions are Ghana (92 kg), Cote d'Ivoire (83 kg) and Cameroon (72 kg) respectively (Baruwa *et al*., 2011)

Despite her prominent ranking and placement amongst leading plantain producers in Africa and in the world, Nigeria produces mainly for local consumption than for export, as revealed by national per capita consumption statistics (FAO, 1987). Plantains are eaten after frying, boiling, pounding or roasting etc. Consumption data are high and rapidly increasing due mainly to rapid urbanization and the resultant increased demand for easy, convenient foods; rising demands for the popular local delicacy and snack (plantain chips), amongst many other factors (Lescot and Ganry, 2010). *Musa* cropping systems furthermore, present best opportunities for sustainable agriculture especially in high rainfall zones. Highland bananas, for instance, reduce soil erosion on steep slopes and are principal sources of mulch for maintaining and improving soil fertility (INIBAP, 1986)

The benefits of plantain crops to mankind and society are generally-speaking unquantifiable. Sadly however, their production is currently threatened locally and globally by a complex of factors, namely: rising population pressure, land tenure challenges, reduced land fallow periods, declining soil fertility, complex and increased pest and disease pressures, drought and wind attacks, amongst many others (Lescot and Ganry, 2010; Chabi *et al*., 2018; Tenkuoano *et al*., 2019).

This study was aimed at determining farmers' preponderant viewpoints or perceptions about the production constraints of plantains in our immediate environment (i.e. the Rivers State University community and its environs) via a rapid participatory rural appraisal approach. The specific objectives were to: (i) assess the farmers understanding and perceptions of the production constraints (ii) empower farmers to correctly detect and identify the actual production constraints and causative agents (iii) help develop simple, appropriate and cost effective training packages/programmes for farmers education (iv) emphasize the need for regular collaborative linkages between farmers and Agricultural extension agents and with Research institutions, in order to achieve or guarantee proper enlightenments and training.

It is hoped that at the end of this study, farmers shall be appropriately equipped with sound knowledge of the actual plantain production constraints and also empowered technically to ably tackle them. The knowledge so gained, shall effectively help to curtail production losses and ultimately lead to enhanced and increased plantain yields.

Materials and Methods

Study sites and methodology: Thirty (30) plantain farms consisting of both small backyard plots and field plantations within and around the immediate vicinity of Rivers State University (RSU) Port Harcourt (4.795^{o}N, 6.975^{o}E), and the Agricultural Development farm area, Rumuodomaya Port Harcourt (4.810^{o}N, 6.976^{o}E) (Fig. 1) were randomly selected for this study. Plots around residential quarters and hosting at least 30 plantain stands or more, were considered as backyard plots, while farms located away from homes and with land areas of 1 ha or more served as field plantations. A total of fourteen (14, i.e. 8 plantations and 6 backyard farms) were obtained at RSU area of Port Harcourt while sixteen (16, i.e. 8 plantation and 8 backyard farms) were used at the Agricultural Development Programme (ADP) farm area, Rumuodomaya Port Harcourt respectively.

Structured interviews via use of a slightly adapted Questionnaire of previous workers (Schill *et al*., 2000) were conducted on key informants (major plantain farmers) and on groups (any collection of 2 – 5 local farmers), for their esteemed opinions/viewpoints on the plantain production constraints. On-the-spot checks were done on all info received from respondents, to ensure proper verification of facts/responses received, and to avert unnecessary contradictions.

The data generated, like those of previous workers are purely of a qualitative nature; thus not subject to any statistical analysis. However, simple descriptive statistical tools (Tables, bar and pie charts) were used to facilitate logical and meaningful presentation and interpretation of collected data.

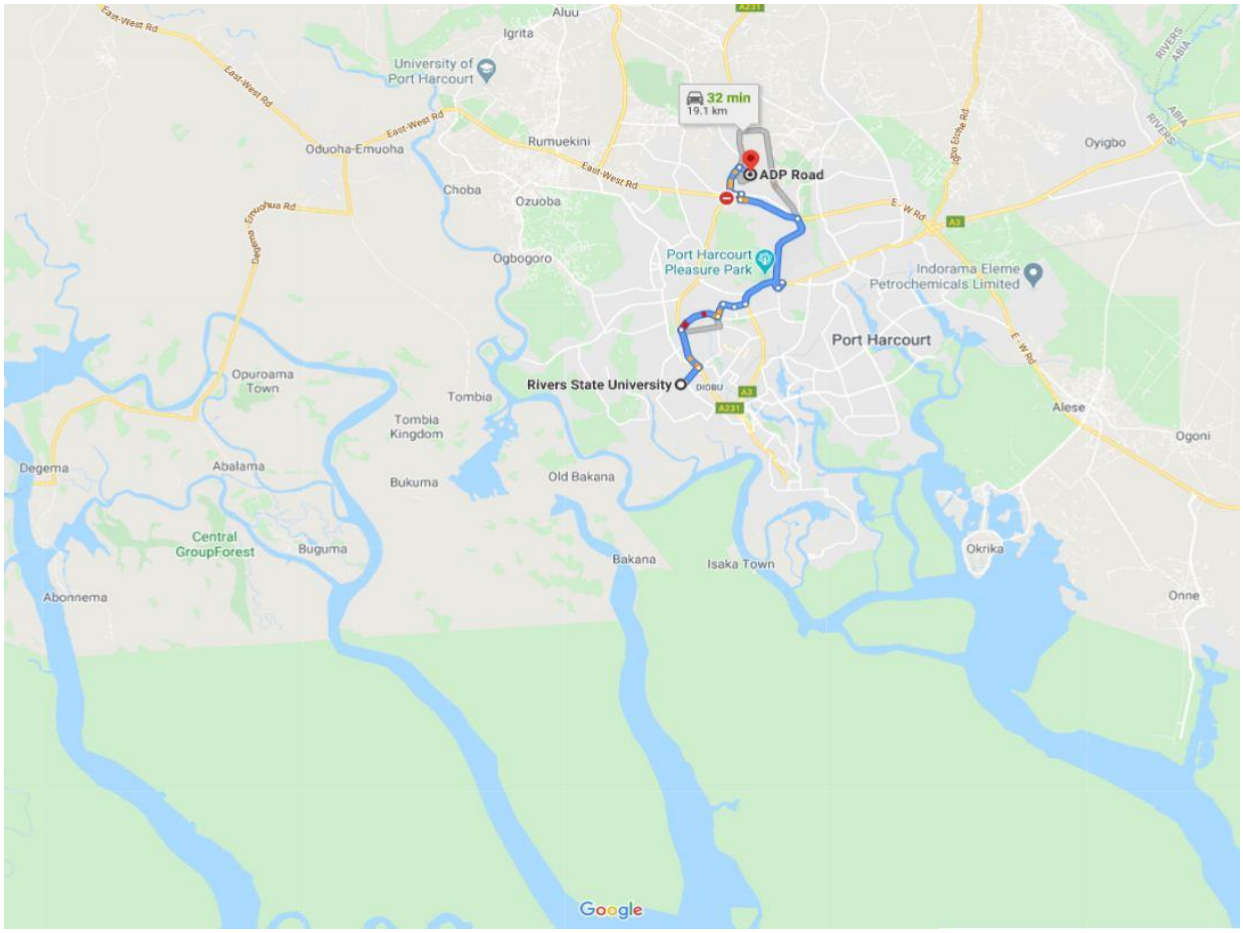


Fig. 1: Map showing survey locations (Rivers State University, Nkpolu-Port Harcourt and the Agricultural Development Programme, Farms at Rumuodomaya, Port Harcourt) and environs

Results

Farmers' Perception of Plantain Production Constraints: Table 1 presents the overall (summarized) views of respondents to the subject of plantain production constraints, including their order of importance (or "Rankings"), with respect to the study area (i.e. Port Harcourt metropolis).
The major constraints and their rankings as perceived by them are viz: poor soil fertility, wind, drought, disease, theft, land pressure and flood matters, "breakage", excess sucker formation, misuse of fertilizers and agrochemicals. The details are presented graphically and in pie chart in Fig. 2.

Table 1: Overall Summary of Farmers' Perceptions and Ranking of the Plantain Production Constraints in Port Harcourt Metropolis, Southern Nigeria

Constraints as Perceived by Farmers	**Ranking and Frequency of Mention**			**Cumulative Score**	**Overall Ranking**
	1st	**2nd**	**3rd**		
Soil	3	8	5	16 (64%)	1st
Wind	11	1	3	15 (60%)	2nd
Drought	7	7	1	15 (60%)	3rd

Disease	2	1	10	13 (52.5%)	4th
Theft	2	4	3	9 (36%)	5th
Breakage	2	3	2	7 (24%)	7th
Excessive Suckers	1	0	2	3 (12%)	8th
Misuse of Fertilizers & Agrochemicals	1	1	1	3 (12%)	9th
Others (land pressure, floods etc)	1	5	3	9 (36%)	6th
	30	**30**	**30**	**90**	

Data here indicates the no. of times (frequency) a particular constraint was mentioned as being important by different Respondents/Farmers

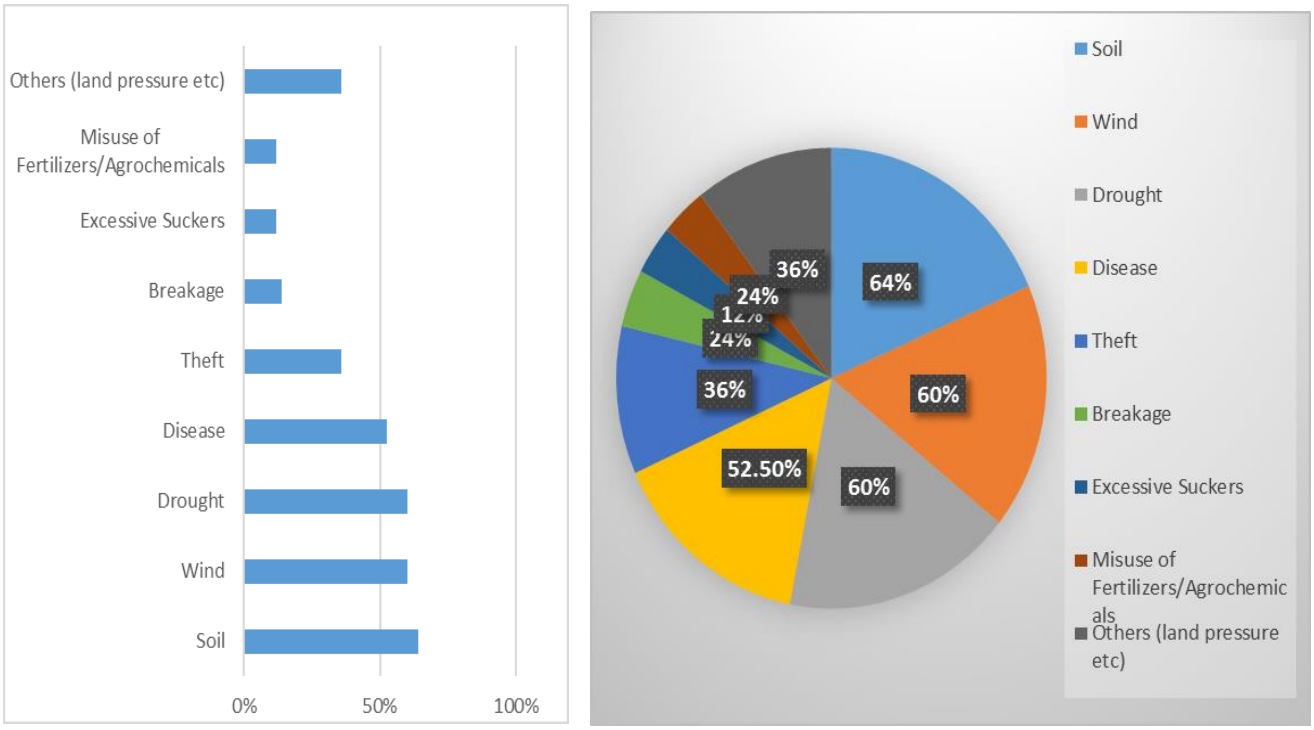


Fig. 2: Farmers' Perception of Plantain Production Constraints in Port Harcourt Metropolis, Southern Nigeria

The Researcher's (or Expert's) Findings and Viewpoints: Farmers were generally ignorant about weevil and nematode attacks – as they could not relate fallen stands i.e. 'snapping' and 'toppling' of pseudostems to weevils and nematodes respectively. They attributed all fallen stands to winds (what they called "breeze" effects)

Few fallen stands that were dissected at the different locations, clearly revealed weevil tunnels and sometimes even presence of grubs (borer larva) and adult weevils at other times. Two main weevil species were identified as the major insect pests creating corm tunneling and snapping of pseudostems in this region, namely: *Cosmopolites sordidus* Germar (majorly) and *Metamasius hemipterus* (L) (to a lesser extent) - both Coleoptera: Curculionidae.

Toppled (uprooted) stands – which are very characteristic of nematode attacks were all attributed by farmers to "breeze" effects.
Black Sigatoka (the fungal *Mycosphaerella fijiensis*) symptoms were very widespread in virtually all the sites visited. But farmers attributed the necrotic leaves observed on the plantain leaves to sunlight effects (what they called "dryness"). Same was true for viral streaks i.e. the banana streak virus attacks found on the plantain leaves; they attributed these to "dryness" or sunlight effect.
Farmers' idea or classification of a "diseased" plant was rather a confused lumping of all pathogenic (bacterial, fungal or viral), and of insect pest and nematode attacks on fruits and pseudostems etc.; and sometimes even fallen stands.

Plates 1a & b present images/pictures of some of the observed constraints in the field, the farmers' viewpoints and rankings of the constraints, control measures adopted by them, the researcher's (or expert's) diagnosis of the constraints and the recommended control strategies for adoption.

Plate 1a: Images of the prevalent constraints, the farmers' viewpoints and control attempts; the actual diagnosis and recommended control strategies

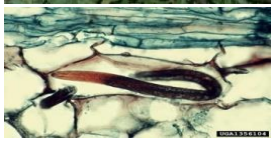
Plantain Production Constraints			
Farmers perception	• Poor Soil • Acclaimed by farmers as the No. 1 production constraint	• Wind ("Breeze" effect) • Acclaimed as the 2nd major constraint	• Wind ("Breeze" effect) • Acclaimed as the 2nd major Constraint
Actual diagnosis	• Poor or declining soil fertility	 Uprooted plant (Toppling)  The burrowing nematode (Causative agent)	 Weevil tunnels (cause snapping)  Weevil larva (borer)  Adult weevils: *C. sordidus*  *M. hemipterus*
Control strategy by farmers	• Use of Inorganic fertilizers • Use of wood ash • Mulching • No action • Farm abandonment	 • Propping	 ○ Propping
Recommended control strategy	• Crop rotations • Organic fertilizers • Farmyard manure or kitchen wastes	 • Paring • Hot-Water treatment • Improved/resistant varieties or Tissue culture materials.	   • Paring • Hot water treatment • Pseudostem Traps • Improved varieties or Tissue culture materials

Plate 1b: Images of the prevalent constraints, the farmers' viewpoints and control attempts; the actual diagnosis and recommended control strategies

Plantain Production Constraints		
Farmers perception	• Drought ("Dryness" (or sunlight effect) • Acclaimed as 3rd major constraint	• Not recognized by farmers as a constraint • Attributed such symptoms to sunlight effects)
Actual diagnosis	• Fungal attacks (Black Sigatoka) • Necrotic leaves widespread on most farms visited	• Banana streak virus (BSV) symptoms on leaves
Control strategy by farmers	• No action	• No action
Recommended control strategy	• Use improved/resistant varieties or Tissue culture materials	• Uproot infected stands & burn • Use resistant varieties or Tissue culture materials

Discussion and Conclusion

The rural appraisal surveys have revealed the following as farmers' general perception of the plantain production constraints in Port Harcourt metropolis (in order of importance): poor soil fertility (64%), wind (60%), drought (60%), disease (52.5%), theft (36%), land pressure/floods etc (36%), breakage (24%), misuse of fertilizer and agro-chemicals (12%) and excessive sucker (12%) (Table 2). The category Wind and Drought occupied a joint second (2^{nd}) position (60% each); Theft and Land Pressure/Floods etc., similarly shared fifth (5^{th}) position while "Breakage" came seventh (7^{th}).

The findings on the other hand, also clearly revealed much ignorance and confusion on the part of farmers, regarding the constraints assessments and rankings. For instance, the farmers' categories of "Wind/Breeze effects" and "breakage" should both have fittingly constituted a single group, and named "Pests-Group". Similarly the other categories so-called "Drought" (aka "dryness or sunlight effects") and "Disease" should also have been a single unit named "Diseases-Group". In fact, all four (4) separate units should have been merged into a single unit named "Pests and Diseases". Such a fusion/merger would also have positioned the group (Pests and Diseases) as even the predominant constraint. Therefore judging from a professional viewpoint the actual constraints in this region should rightly have been: Pests and Diseases (1^{st}), Poor soil fertility (2^{nd}) and Drought (3rd). But the Researcher/Investigator remained as professional as possible by not interfering – thereby allowing the farmers a free-hand in their assessments and rankings.

Farmer confusions were often appalling because at one instance they pooled (or subsumed) what should rightly be separate units e.g. BSV (viral attacks) and Black Sigatoka (fungal attacks) into a single category called "Drought" (aka Dryness or Sunlight effects). Then at another instance (as already stated above), they separated (segregated) what should rightly be a single unit (category) e.g. Pests and Diseases into 4 different categories of Wind or Breeze effects, Breakage, Drought and Disease. Farmer confusions were not peculiar to this study alone, as they were also reported by earlier authors too. In Uganda for instance, farmers attributed attacks of root nematodes and of pathogens on leaves to either the plantain-banana weevil or to senescence. They even claimed that black ants constituted a major constraint to plantain production (Gold *et al*., 1993); a position that is unsubstantiated and widely believed to be erroneous. Ants are generally known to be predatory in nature and not crop pests. Both Gold *et al*., (1993) and Schill *et al*., (2000) additionally reported that farmers overestimated the influence of Pests, in their separate studies in Uganda and Ghana respectively, since they were even oblivious of nematode and black Sigatoka attacks/damages.

In all of the different and independent studies in Uganda, Ghana and Nigeria on plantain production constraints, the key or principal constraints have been Poor Soil Fertility and Pests and Diseases; though the rankings differed from one case to another.

The very striking revelation from all of these studies is the urgent need for Enlightenment and training programmes for farmers. For instance, even at sites where several incidences of fallen stands were noticed (which were obviously due to combined effects of weevils and nematodes); they could not link such fallen stands to these causative agents (see Results section and Plate 1). They could also not link dry, necrotic leaves to sigatoka attacks. They rather considered such incidences as being due to drought – what they called "dryness" or sunlight effect. Obviously, dry season has its toll on plantain leaves and stands, as it can cause withering and other water related stresses, but black sigatoka symptoms of characteristic black leaf spots, streaks and necrosis are always very obvious to the "trained eyes" (trained farmer or researcher). Similar observation were also made by (Gold *et al*., 1993) in Uganda and Schill *et al*. (2000) in Ghana.

These surveys have also revealed that the major insect pests and diseases in this study are: the banana weevils, mainly *Cosmopolites soridus* Germar and *Metamasius hemipterus* (L) (to a lesser extent) - both Coleoptera: Curculionidae; and the black sigatoka (caused by the fungus *Mycosphaerella fijiensis}*.

The current control practice for these known constraints globally, are (for banana weevils): setting of pseudostem traps, synthetic pheromones to attract adult weevils, use of pared and improved planting materials etc.; and for black sigatoka attacks, use of fungicides and use of improved or resistant varieties.

The measures adopted so far by farmers to check problems of poor soil fertility as presented in (Plate 1) included, application of fertilizers, wood-ash and mulching etc. These acts or efforts may be commendable but farm-yard manure would be the best alternative for plantain plots. Small backyard farms which readily received kitchen-waste, farmyard manure or organic wastes, always performed better than fertilizer applied fields. Labour and cost implications may however, make this recommendation difficult to adopt on plantation farms.

These surveys revealed that farmers generally have some perceptions (whether wrong or right) about plantain production constraints. There is therefore a need for a timely intervention by trained personnel in order to check uncontrolled use, and/or gross abuse of chemicals in control of perceived production challenges. Weevils and nematodes infested materials cannot be effectively controlled by spraying of chemicals because the causative agents are already protected *in situ*. There is also need for proper timing of controls. The best time to control these pests is at planting times when farmers ought to use pared (i.e. properly trimmed or clean) planting

materials, improved varieties etc., These are simple, cost effective measures that can arrest, tackle these observed challenges. An urgent need therefore exists for establishment of training workshops to help educate our local farmers. There is also need to expose these farmers to agricultural extension services for further updates. Collaborations with research Institutes will also afford them with steady supply of improved or tissue culture materials (i.e. pests and disease-free planting materials).
The different skills and knowledge acquired by farmers from such trainings and collaborations, would ultimately help to prevent/check the yearly plantain production losses, and thus help to improve farmers' annual productivity from these areas.

Recommendations

The following recommendations are hereby made based on the findings from present study;

- There is need to train farmers on simple ways of detecting and identifying plantain production constraints on farms.
- This should then be followed by correct and simple cost effective control measure (paring, pseudostem trapping, use of improved planting materials etc). The knowledge and skills gained here will prevent wrong judgments by farmers and thus help to curtail or check the wrong use and the frequent abuse of chemicals by farmers in this region
- Periodic extension services to farmers and contacts with research institutes are also recommended for farming updates and for current global best practices. This shall check large-scale preventable crop losses, the problems of farmers-ignorance, and hence eventually enhance productivity from farmers' fields.

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