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Diagnosis of Nutrients Constraint of Increasing Peanut Yield on Alfisol

Y. Al. Sudaryono and Andy Wijanarko
Indonesian Legume and Tuber Crops Research Institute (ILETRI)
Jl. Raya Kendalpayak Post Office Box 66 Malang 65101
Correspondence Author's Contact: HP. 081 334 727 75; E-mail: sudaryono_balitkabi@yahoo.com

Abstract – **Diagnosis and characterization of land is one important step to distinguish: a constraint of increasing yield, type of management is being required, and yield potential figure. The research was done and concentrated in Ngadirojo subdistrict, Wonogiri, Central Java province. The methode of survey is soil sampling and taking soil sample in top soil in 0-20 cm depth. Soil samples were taken up from 11 villages, each villages was taken randomly at two sites. Analysis of soil sample consisted of status P, K, Ca, Mg, S, pH, C-organic and micro nutrients Fe and Zn. A part from soil sampling, it was done yield cut survey for peanut at the famers field. The agronomic data of yield cut survey consisted of yield and component of yield.**

The result of diagnosis and chracterization indicated that (1) all the villages area of Ngadirojo sub district have low nitrogen fertility, (2) The phosphorus fertility in Ngadirojo is vary, there are six location (27%) having low P fertility status, eleven location (50%) having medium P fertility status, and five location (23%) having high P fertility status, (3) Potassium fertility status in Ngadirojo indicated that 45% area have low K fertility and high status for the rest, (4). The sulfur fertility is vary from low to high, (5). The Ca, Mg, and micronutrients are high at all location of Ngadirojo sub distrist, (6). There is a big challenge to minimize yield gap of peanut at Ngadirojo sub district, and (7) At farmers level, the hole planting techique by hue ("sistem koak") produced peanut yield higher than drill ("tugal") technique. It can be concluded that the N, P, K, and S are considered as the constraint nutrients for increasing peanut production in Alfisol of some area of Ngadirojo sub-district. All area in Ngadirojo sub-district having a good fertility for the secondary nutrient such as Mg and Ca, and the micronutrients such as Fe, Cu, Mn. There is an opportunity to increase peanut yield by improving farmer's practice using innovative technology, especially by improving nutrients and crop management system.

Keywords – Peanut, Nutrient, Alfisol.

I. Introduction

East Java and Central Java are peanut production centers in Indonesia, which reached broad approximately 250 thousand hectares and mostly grown in dry land on the red soil that has a crumb structure, which in general is Alfisol and Oxisol. Alfisol and Oxisol soil types in Java is estimated at 0.33 million hectares [6]. Area harvested peanut plants in the Wonogiri district covering 30,831 ha with an average productivity of 1.14 t dry pods/ha [11]. In other words, the contribution of the peanut crop harvested area of Wonogiri district as much as 12.33 % of harvested area of East Java and Central Java, and the total production in 1999 amounted to 35,194 t of dry pod. Thus the Wonogiri district is one of the peanut production centers in Indonesia which should be taken into account. Alfisol and Oxisol soil types have high diversity of chemical properties. The results of the analysis of the origin Jakenan Oxisol soil (Central Java) has a pH range from very acidic to near neutral (4.8 to 6.8), P content from low to high (5-13 ppm P), the content of K, Ca and Mg in generally low, and the content of micro elements (Cu, Zn, Fe, Mn) varies from low to moderate. The results of the soil analysis of several areas in East Java showed that soil pH varies from acidic to strongly alkaline (5.5 to 8.4), the content of low to high K, Ca and Mg content ranged from moderate to very high [18]. The existence of a diverse range of fertility status has the consequence that the dose and type of fertilizer recommendations will vary as well. Knowing the nutrient status of the soil is not enough if it is not followed by testing the response of plants. For example, the nutrient status of soil P Alfisol Tuban is high (36-86 ppm P), but the equivalent of 50 kg of P fertilizer P2O5 still can improve peanut yield by 37.4 % [10]. Reference [1] reports that peanuts are planted on Tuban Alfisol no response to the addition of Fe and S, being the land Alfisol from Jepara response to the provision of 37 kg S/ha. The addition of S up to a dose of 400 kg S/ha increase peanut yield in Tuban Alfisol soil, but had no effect when applied to the soil Lamongan Alfisol [17]. The addition of K, Ca, Mg at level 15% - 20% of the value that can be exchanged in the soil increase peanut yield 30% to 70% in the Lamongan Alfisol, but in the Tuban Alfisol tends to lower results [18]. Peanut productivity at the farm level is still low at 0.6-1.2 $t.ha^{-1}$ in the dry land and 1.2-1.8 $t.ha^{-1}$ in paddy fields (CB, 1998). The results of the study of soil fertility improvement and cultivation method can achieve the dry pods 2.5-4 $t.ha^{-1}$ [15]. Based on the above examples show that describe agroecological or concerning a concept of "prescription farming" is crucial, because by describing an agroecological region will know what factors might be an obstacle in the improvement of agricultural production. Relevant with this study is to describe the fertility status of the soil type of dryland Alfisol for peanut commodities, which are expected to obtain information about the macro and micro nutrients that may impede the increase in peanut production, which would then be used as a basis for further research planning preparation and fertilizer recommendations in type or dose that would be obtained optimum fertilizer efficiency.

Characterization of macro nutrient status (P, K, Ca, Mg and S) and micronutrients (Fe, Zn, Mn, and Mo) in Alfisol soil in peanut production center in East Java and Central Java needs to be done to be used as the basis for determining the need fertilizer in order to achieve an

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efficient fertilization. This information is very important in terms of building a data base to be used as a basis for research activities, especially fertilizer and fertilizer needs fixing basic recommendations in general. This study aims to: (a) Obtain information nutrient status of N, P, K, Ca, Mg, S, Cu, Mn, Fe, Zn, CEC, pH and C-organic soil of Wonogiri Alfisol, and (b). Getting the optimal and efficient formulation of nutrient needs based on "prescription farming" approach for the peanut crop in dryland Alfisol.

II. Methods

Research done in dry season 2002 year, in the Ngadirojo sub-districts, Wonogiri district, Central Java province by survey and soil sampling at the upper soil layer (top soil) with a depth of 0-20 cm. Soil samples were taken at eleven villages and each village set two soil sampling points at random to represent the village in question. Soil samples were sent to the laboratory for Soil and Crop of Indonesia Legume and Tuber Research Institute (ILETRI) to be analyzed. Chemical analysis of soil samples include pH (KCl, H2O), N, P, K, Ca, Mg, S, Cu, Mn, Fe, Zn, CEC, and C-organic soil. To obtain a picture of the productivity of peanut in the Ngadirojo district was done yield cut survey for peanut crops in farmers' fields with local farmer's practice. Given the research carried out during the dry season then pull out the peanut crop planting done available, ie the wetland or dry land that can be irrigated with the water pump. There are two cropping systems were used as the basis for grouping the sampling results, the drill planting systems and planting systems by hue ("Koak" system). Yield cut survey was done with sampling plot size 2 m x 5 m. Agronomic observations on peanut plants consist of the pod yield (kg fresh pods/10 m2) as the basis for calculation of dry pod peanut yield ($t.ha^{-1}$), fresh and dry weight shoots ($t.ha^{-1}$), number of productive pods and empty pods per plants .

III. Results and Discussion

Diagnosis and chemical characterization of the soil in the region of Ngadirojo sub-district, Wonogiri District.

Results of soil chemical analysis for all 22 sampling sites are presented in Table 1. Soil acidity (pH of soil) in 9 villages of Ngadirojo sub-districts are generally classified as slightly acid, pH ranged from 5.35 to 6.75 (Table 1; Figure 1). The ideal soil pH range for peanut crop is 6 to 7.5 [22]. Peanut plants like the soil pH ranges from 5.5 to 6.5 (Halliday and Trenkel, 1992). The village area that has a pH is acidic enough Jatimerto Village, Mloko Manis, Mloko Manis Wetan, Kerjo Kidul, Kerjo Lor, Ngadirojo Kidul, Mloko Kidul, Gemawang, Kasihan, and Gedong. The village area which has a slightly acidic pH is Ngadirojo Lor village, Mloko Manis Kulon, and Pondok Kulon. Based on the variability of pH H2O with pH KCl (Table 1), Alfisol in Ngadirojo district area has the mineral characteristics of a stable charged (permanent charge). It is characterized by the difference between the value of pH (H2O) with pH KCl which is positive [9].

Levels of soil organic matter at mostly rural areas in the Ngadirojo district have low C-organic matter content, ie < 2% (Table 1). There are several villages which had higher levels of C-organic that were Kerjo Lor village, Ngadirojo Kidul, and Gemawang. According to this fact indicates that farmers still have less attention to the application of organic fertilizers. There are several causes that may be a factor aggravating farmers use organic fertilizers, which are (1) inadequate availability of organic fertilizers, farmers do not have their own cattle, (2) the needs of optimum high enough organic fertilizer to each unit area of land so high operational costs, (3) organic fertilizer has slow character available of nutrient (4) organic fertilizers, especially manure becomes a source of weeds, and (5) the application of organic fertilizer immature (ratio C/N >12) cause demineralization of nutrients (especially N) by soil micro-organisms.

Peanut yield high with good quality requires support from both the supply of nutrients in the soil. There are sixteen basic nutrients for the plants considered although not entirely proven staple for some species. The sixteen elements are carbon (C), hydrogen (H), oxygen (O), nitrogen (N), phosphorus (P), potassium (K), calcium (Ca), magnesium (Mg), sulfur (S), zinc (Zn), manganese (Mn), iron (Fe), copper (Cu), boron (B), molybdenum (Mo), and chloride (Cl) [4]. From the sixteenth nutrients, elements C, H, and O are provided by the air (atmosphere) or the air in soil pore spaces and are called non - mineral nutrients [14].

Table 1: Performance of soil chemical characteristic of Ngadirojo sub-district, dry season 2002

Site/ Farmer	pH		C-Org	N	P2O5 BI	SO4	Fe	Cu	Mn	K	Ca	Mg	CEC
	H2O	KCl	---------%----------		-----------------------ppm-----------------------------					-------------------me/100g------------------			
1	5.95	4.6	1.34	0.10	10.4	99.9	38.3	1.85	134	0.19	8.87	4.95	24.2
2	5.85	4.75	1.34	0.08	8.20	60.6	19.1	1.66	61.2	0.19	14.6	7.05	34.4
3	5.70	4.8	2.20	0.11	8.29	131	45.4	2.38	178	0.47	23.0	7.71	24.2
4	5.75	5.0	2.08	0.11	9.54	44.1	66.9	5.39	208	0.43	17.0	7.81	28.0
5	6.15	5.3	1.47	0.10	10.9	17.2	33.5	2.11	108	0.50	22.3	7.32	20.3
6	6.75	4.6	1.47	0.09	6.86	41.6	39.8	2.02	184	0.47	11.6	3.63	20.3
7	5.80	4.85	2.08	0.09	9.90	151	49.4	2.55	199	0.79	10.6	5.25	36.0
8	5.75	4.8	1.22	0.10	5.07	13.1	36.5	2.11	150	0.27	12.2	5.72	34.4
9	5.70	4.8	1.01	0.08	6.85	135	39.2	2.64	157	0.18	7.62	3.48	32.0

10	5.85	4.9	1.34	0.09	8.46	39.9	67.2	4.41	212	0.68	10.8	4.97	28.0
11	5.50	4.5	1.48	0.09	2.56	302	37.9	2.47	159	0.58	9.85	4.69	20.3
12	6.05	4.9	1.59	0.11	6.85	128	52.3	4.15	229	1.37	15.2	5.80	12.8
13	6.05	5.3	1.10	0.06	10.2	335	12.5	0.78	235	0.65	15.4	6.49	31.7
14	6.15	5.3	1.59	0.09	3.10	346	22.8	2.02	43.7	0.77	20.8	7.26	39.7
15	5.85	5.0	2.20	0.10	8.64	129	47.8	2.38	142	0.24	24.9	8.17	46.8
16	5.65	4.7	1.22	0.10	12.2	482	46.8	2.11	146	0.18	20.6	7.22	39.7
17	5.85	4.9	1.47	0.09	12.7	6.86	74.8	3.53	231	0.18	16.3	6.21	23.4
18	5.35	4.4	1.10	0.08	10.6	276	59.8	3.35	210	0.21	6.10	6.27	23.4
19	5.85	5.0	1.34	0.09	11.5	251	41.7	3.70	166	0.14	15.1	5.65	7.94
20	5.75	4.9	1.47	0.09	2.74	275	58.5	4.33	249	0.22	14.2	5.65	11.9
21	5.85	5.1	1.34	0.09	10.9	125	88.0	3.35	213	0.71	20.7	8.44	11.9
22	5.80	4.9	0.95	0.05	11.6	383	18.6	2.81	45.6	0.67	17.4	8.89	23.8

Note : : CEC = cation exchange capacity;

1. Kerjo kidul	: Yatno	9. Mloko kidul	: Sarimo	17. Jatimerto	: Edi Pranoto
2. ,,	: Tukar	10. Mloko manis	: Darmin	18. ,,	: Citro Resmi
3. Kerjo lor	: Narto W.	11. Mloko wetan	: Suratno	19. Kasihan	: Kasno
4. ,,	: Cipto W.	12. Mloko kulon	: Martono	20. ,,	: Saino
5. Ngadirojo lor	: Kromo T.	13. Pondok Kulon	: Sarmi	21. Gedong	: Kasidi
6. ,,	: Yono	14. ,,	: Siswanto	22.Gedongwetan	: Kartoyo
7.Ngadirojokidul	: Sariman	15. Gemawang	: Soekarno		
8. -	: Sonto M.	16. ,,	: Suronggono		

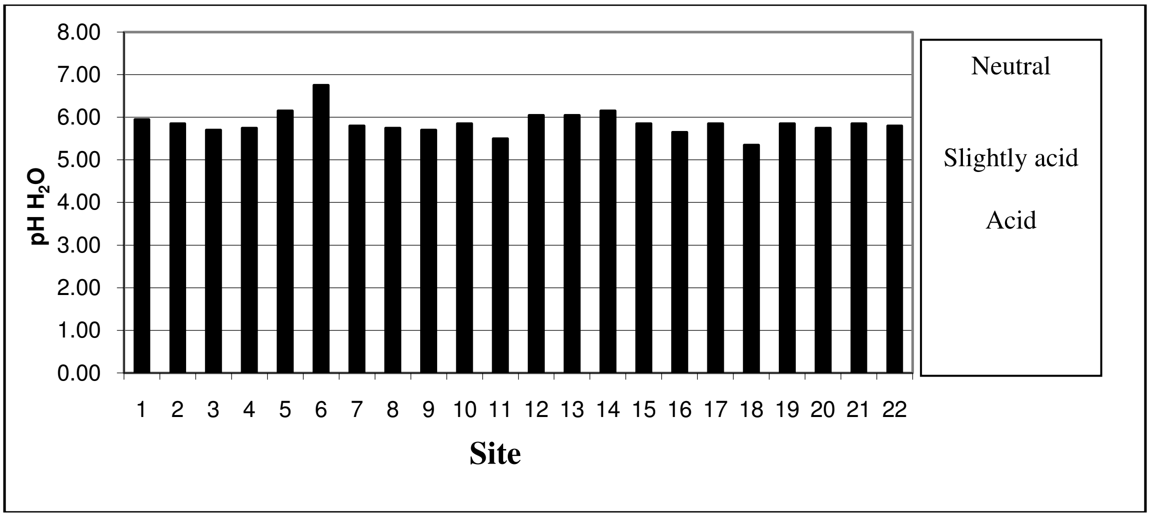

Fig.1. Distribution of soil acidity (pH of soil) at villages of Ngadirojo sub-district, Wonogiri district.

Potentially lower N fertility in all districts of Ngadirojo villages. Nutrient nitrogen is indeed the most labile nutrients compared to other nutrients. Nitrogen is involved in various reactions, ie nitrification, denitrification, oxidation and reduction which these processes provide an opportunity for the occurrence of N loss through volatilization and leaching. Therefore, non-farm commodities nuts require additional fertilizer N is high enough to meet the needs of optimum.

Fertility phosphorus (P) in the district area Ngadirojo range from low to high. P2O5 levels as low as 2.56 ppm found in the location belongs Suratno (Mloko Manis Wetan) and the highest was 12.7 ppm found in locations owned Edi Pranoto (Jatimerto) (Table 1). P fertility status for the village districts Ngadirojo scope can be checked in Figure 2 . Land with P2O5 content of < 6 ppm have low P fertility dignity [7]. The village area that has a low P fertility dignity found in the location Ngadirojo Lor (6), Ngadirojo Kidul (8), Mloko Manis Wetan (11), Mloko Manis Kulon (12), Pondok Kulon (14), and Kasihan (20). At these locations required additional fertilizer P. According to Sudaryono [13], application of 50-75 kg SP-36 or rock-P/ha is sufficient to obtain the yield of peanuts around 2 t/ha. Areas that have moderate P fertility status with P2O5 content of 6-10 ppm is the location of the Kerjo Kidul and Kerjo Lor (1-4), Ngadirojo Lor - Kidul (5-7), Mloko Manis (10), Pondok Kulon (13), Jatimerto (18), and Gedong (21). The village area that has a high P fertility with levels > 10 ppm P2O5 found in the village Gemawang (16), Jatimerto (17), Kasihan (19) and Gedong

Wetan (22). Areas with high P fertility, P application should not be given any time of planting. For the purpose of maintenance of soil P status, P fertilizer application can be given once a year with a rate of 50-75 kg/ha rock-P or SP-36. Reference [19] reported that P and Fe deficiency is common in Alfisol in East Java which has a base pH (7 to 8.4), whereas in Central Java Alfisol showed relative low pH (5 to 6.9) and low Ca levels. Further stated that, most of the Alfisol (60 %) both in East Java and Central Java require fertilizer P and N.

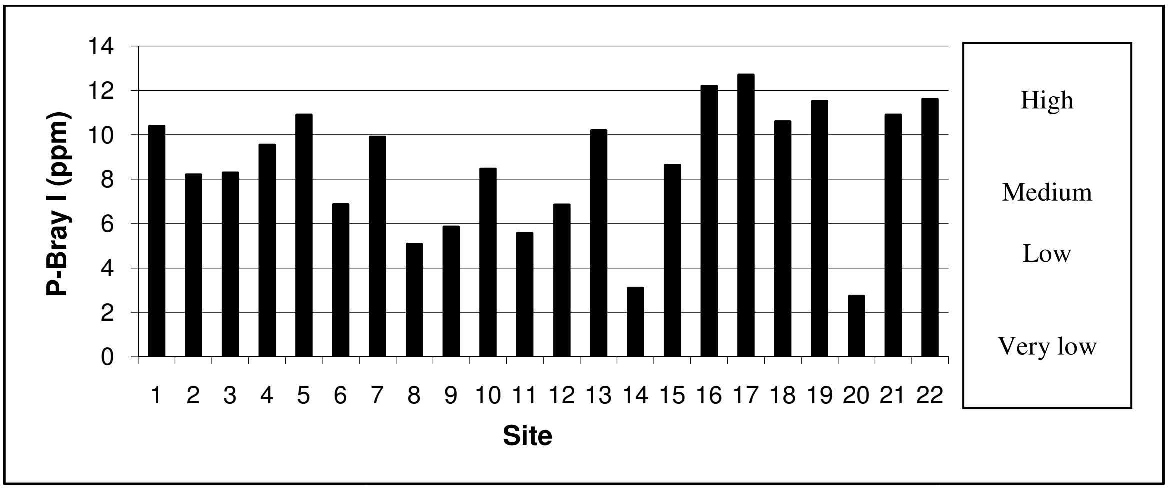

Fig.2. Distribution of fertility available P (Bray I) in the village area of Ngadirojo sub- district, Wonogiri 2002

S nutrient fertility in rural areas Ngadirojo sub-districts ranged from very low to very high. S fertility status for the village of Wonogiri scope, especially at Ngadirojo sub-districts can be examined in Figure 3. Critical limit nutrient sulfur (S) in soil in general is 10 ppm [3]-[16]-[22]. Based on the critical value limits, there are some rural areas that have critical levels of S, ie the location no.17 farmers' Edi Pranoto, Jatimerto with levels of 6.86 ppm SO4. Other villages which have low S status is the location no. 8 and 5, respectively belonging to farmers Sonto Mulyono (Ngadirojo Kidul) and Kromo Tardi (Ngadirojo Lor) with SO4 levels respectively 13.1 ppm and 17.2 ppm (Table 1). As for the other village areas have a high S fertility. To meet the needs of S, farmers are encouraged to use fertilizers containing S, such as ZA, ZK-plus, biological fertilizers containing sulfur oxidizing bacteria, sulfur and fertilizer (pure S/elementary).

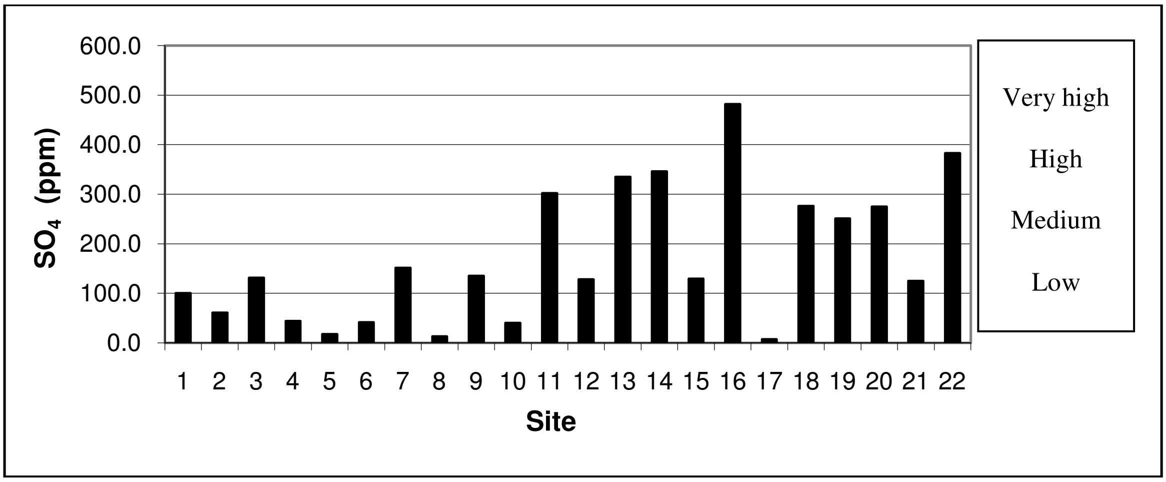

Fig.3. Distribution of S nutrient status in the village area of Ngadirojo sub- district, Wonogiri 2002

Potassium fertility (K) in the village area of Ngadirojo sub- district, Wonogiri range from low to very high. Picture of K fertility status in rural areas districts Ngadirojo scope can be checked in Figure 4. Critical limit nutrient potassium (K) in the soil was 0.2 to 0.3 me K/100 g [7]. There are 10 rural areas (45 %) on Ngadirojo districts that have low K status, ie at the location no. 1, 2, 8, 9, 15, 16, 17, 18, 19, and 20 (Table 1). Application of K fertilizer needs attention at all ten locations. K alternative source of considerable potential, and competitive prices are cheap relative ZK-plus, kitchen ash, rice husk, and manure. The increase in soil K status of 10 % of the K available on Alfisol (from the initial K content of 0.19 g K/100 me) can improve peanut yield of 0.87 t/ha to 2.73 t/ha [13]. Critical limit nutrients calcium (Ca) and magnesium (Mg) in the soil is 1.5 me Ca/100 g and 1 me Mg/100 g (Tandon, 1989). Based on this limitation all villages scope Ngadirojo districts still have a high fertility

Ca and Mg. Even for Mg has a very high status. Nutrient balance of K, Ca , and Mg should receive careful attention to obtain optimal yield of peanut. Reference [17] reported that the addition of K, Ca, and Mg between 15-20% in the Alfisol (with the status of the initial nutrient 0.37 me K/100 g, 4.47 me Ca/100 g, and 0.52 me Mg/100 g) of the exchangeable value of K, Ca, and Mg may improve peanut yield by 25-70%. Peanuts is a plant that is unique crop in term of nutrient aspect, which absorbed nutrients directly from the soil through the development of seed pods for more than absorbed through the roots to the leaves and back to seed. Peanut plants require relatively high calcium and especially during pod filling period [5]-[22].

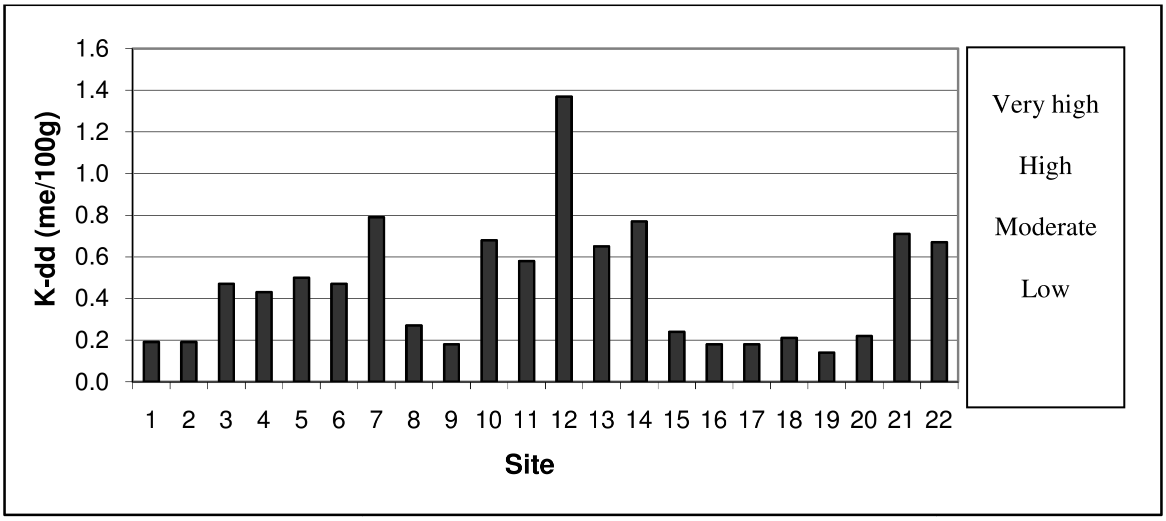

Fig.4. Distribution of K fertility in rural areas Ngadirojo districts, Wonogir year 2002

Critical level of micronutrients such as iron (Fe), copper (Cu), and manganese (Mn) in the soil in a row is 4.5 ppm, 0.2 ppm, and 2 ppm [16]. All villages in the district have a fertility rate Ngadirojo micronutrients as mentioned above is quite high. In the meantime, micro nutrients for the sub region Ngadirojo is not a constraint in crop productivity in general. Cation Exchange Capacity (CEC) in the Ngadirojo sub-district generally quite high and both have an average value of > 20 me/100 g soil, but there are four village areas which have CEC values < 15 me/100 g soil, ie Mloko Manis Kulon, Kasihan, Gedong, and Gedong Wetan. Relevant with the nutrient problem, the diagnosis and characterization of nutrients as constraints on peanut yield improvement at the centers peanut production area becomes very important. Although it was realized that the results of the soil analysis showed bias and often diverse, due to error (error) in the system and the way soil sampling in the field, treatment preparation (drying) prior to laboratory analysis, error analysis procedures, instrument calibration deviation (sensitivity), etc. [8]. Diagnosis and analysis of soil and plant at least give you an idea beginning to be used as a foundation in developing the initial plan of treatment or therapy early in the production system. Today has evolved a new approach in the organization of agriculture, which is appropriate farming ("Farming precission or precission Agriculture") is an illustration of thinking (imagination) many people are concerned on the production of food, feed and clothing [12]. Appropriate farming offers the promise of increasing productivity, reduction of production costs, and minimize the environmental impact of farming (NRC, 19 976 and Sky-Farm, 1999 [12]. Broadly speaking farming system includes five factors, namely varieties of plants, the appearance of land, technology, infrastructure areas, and motivation/attention of farmers. Good alignment of these five factors are able to create a competitive farming systems suited to local conditions.

Performance of harvested area and productivity of peanut in the Ngadirojo sub-district, Wonogiri To complete the picture of peanut yield has been conducted secondary data collection from the field or related agencies in Wonogiri district. Peanut planting area at the district level is 37 348 ha. The centers are peanut crop in district area Ngadirojo (Table 2). An average productivity of peanut at the farm level Wonogiri district is 1.156 $t.ha^{-1}$. Thus there was still high enough change to increase productivity at the farm level. Results of yield cut survey at peanut farmers showed that productivity levels peanuts are very diverse. Fresh pod yield ranged from less than 1 t.ha-1 to more than 2 t/ha and productivity of peanut shoots ranging from 4 to more than 10 t/ha (Table 3). Yield cut survey at the farm level showed that peanut yield potential in the region is high enough at Ngadirojo Wonogiri. Cropping systems can provide different productivity. Cropping systems coax (holes with a hoe) turns out to give a higher productivity compared to the drill system, the average yield of 4.23 t/ha of fresh pod versus 3.83 $t.ha^{-1}$. Similarly, the productivity of shoots of peanut, with the right coax system produce on average shoot fresh 8.2 $t.ha^{-1}$, and was the drill system 5.53 $t.ha^{-1}$. Peanut shoot is an ingredient of green fodder which has a high enough quality.

Table 2: Harvested area, production and productivity of peanut in Wonogiri district 2001

No.	Sub-district	Harvest Area (ha)	Productivity ($t.ha^{-1}$)	Production (t)
1.	Pracimantoro	2,667	1.120	2,986.2
2.	Giritontro	1,664	0.980	1,629.9
3.	Giriwoyo	2,863	1.065	3,050.4
4.	Batuwarno	394	1.075	423.4
5.	Tirtomoyo	1,312	1.010	1,325.4
6.	Nguntoronadi	2,257	1.083	2,443.4
7.	Baturetno	622	1.118	695.6
8.	Eromoko	1,973	1.188	2,344.2
9.	Wuryantoro	215	1.069	229.8
10.	Manyaran	1,418	1.055	1,496.5
11.	Selogiri	403	1.078	434.5
12.	Wonogiri	4,410	1.167	5,146.9
13.	Ngadirojo	6,675	1.278	8,532.7
14.	Sidoharjo	2,276	1.252	2,849.6
15.	Jatiroto	2,457	1.288	3,164.4
16.	Kismantoro	47	1.096	51.5
17.	Purwantoro	378	1.083	409.4
18.	Bulukerto	34	1.021	34.7
19.	Slogohimo	697	1.139	793.6
20.	Jatisrono	955	1.181	1,127.4
21.	Jatipuro	167	1.117	186.6
22.	Girimarto	439	1.189	522.0
23.	Karangtengah	1,339	1.160	1,553.2
24.	Paranggupito	1,686	1.030	1,736.7
	Total District	37,348	1.156	43,168.0

Table 3: Pod yield, shoot, productive and sterile pods in peanut farmer level of Ngadirojo sub-district, Wonogiri dry season 2002

No. Name of farmer	Prod. pod	Steril pod	Fresh pod	Pod Yield of peanut ($t.ha^{-1}$)		Shoots yield of peanut ($t.ha^{-1}$)	
	(2 plant)	(2 plant)	(g/2 plant)	Fresh	Dry	Fresh	Dry
Lowland, drill system							
1. Prasetyo	28	28	70	8,83	4,33	8,33	3,25
2.	30	17	60	5,00	2,60	8,33	3,25
3.	29	10	60	5,00	2,60	5,83	2,27
4.	28	18	60	5,00	2,60	5,00	1,95
5. Sugiyo	17	8	10	0,83	0,43	3,33	1,30
6.	16	15	10	0,83	0,43	3,33	1,30
7.	16	14	15	1,25	0,65	4,58	1,79
Mean	23,43	15,71	40,71	3,83	1,95	5,53	2,16
Lowland, Koak system							
8. Sukiran	16	7	35	2,92	1,52	8,75	3,41
9.	11	8	20	1,67	0,87	8,33	3,25
10.	14	7	30	2,50	1,30	8,33	3,25
11. Wagio	30	15	55	4,58	2,38	8,75	3,41
12.	31	14	60	5,00	2,60	8,33	3,25
13.	40	16	70	5,83	3,03	14,17	5,53
14. P.Lurah	42	13	70	5,83	3,03	6,67	2,60
15.	27	19	50	4,17	2,17	4,17	1,63
16.	40	15	70	5,83	3,03	7,50	2,92
17.	30	20	50	4,17	2,17	5,00	1,95
18. P.Seno	29	10	50	4,17	2,17	8,33	3,25
19.	28	18	50	4,17	2,17	9,17	3,58

20.	26	20	50	4,17	2,17	9,17	3,58
Mean	28	14	50,77	4,23	2,20	8,21	3,20

Conclusion

Based on the soil survey and yield cut survey of peanut, it can be concluded that the N, P, K, and S are considered as the constraint nutrients for increasing peanut production in Alfisol of some area of Ngadirojo sub-district. All area in Ngadirojo sub-district having a good fertility for the secondary nutrient such as Mg and Ca, and the micronutrients such as Fe, Cu, Mn. There is an opportunity to increase peanut yield by improving farmer's practice using innovative technology, especially by improving nutrients and crop management system.

Implications for Research

Based on the results of the diagnosis and characterization Alfisol in the district Ngadirojo can be stated that in general still have a high fertility potential. Low N fertility status need not feared to peanut farming. This is due to the compound N is an element that is very unstable, low numbers shown in the analysis of total soil N did not describe the actual N fertility due to the drying process of the soil sample had experienced decreased levels of N due to the oxidation process so that there may be evaporation N, for peanut farming N needs can be supplied by working symbiosis with bacteria fixing N (Rhizobium sp.). Fertilizer N is needed only in limited quantities (50-75 kg urea/ha) at the early growth. Phosphorus (P) nutrient need attention because there is a 27% area has a low P status and 50% of the area has a moderate fertility status. Thus, to obtain the level of productivity of peanut crop which required the addition of optimum fertilizer P. To obtain precise dose, an fertilizer experiment should be done over the dose P in the field, but as fast anticipatory measures can be used formulation of the results of research on the type of soil that has been done is a kind of 50-100 kg SP - 36 (Sudaryono and Indrawati, 2001). Potassium fertility status in the region of Ngadirojo showed 45% lower K so as to obtain high productivity required the addition of K. KCl is source of K, but it is expensive enough for farmers, so there is an alternative sources of K, such as the kitchen ashes or ashes burning red stone, manure, straw or compost . The status of secondary macro nutrients such as S, Ca, and Mg and micro nutrients (Fe, Zn, Cu, Mn) in the region Ngadirojo still high, so it does not need to be feared. Application of manure to enhance the levels of C-organic and improve soil structure will affect maintain and preserve the status of secondary macro nutrients mentioned above to continue to support the level of productivity of groundnut plants are quite high. To formulate a package of technology and peanut cultivation technology required calibration test and good fertilization experiment in the greenhouse and in the farmer's field, at least the main nutrient limiting factor in the productivity of peanut crop. Research needs to be done not only in the nutrition aspect but also on aspects of soil and crop management. In short done in an integrated cross-disciplinary research in agroecology Ngadirojo so that eventually led to the formulation of specific technology package for agroecological Ngadirojo, especially for peanut cultivation. If the formulation and assembly technologies peanut cultivation in Wonogiri region can be generated, there will be an increase in peanut production are quite high. Thus the supply of peanut production for the Wonogiri region will increase.

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